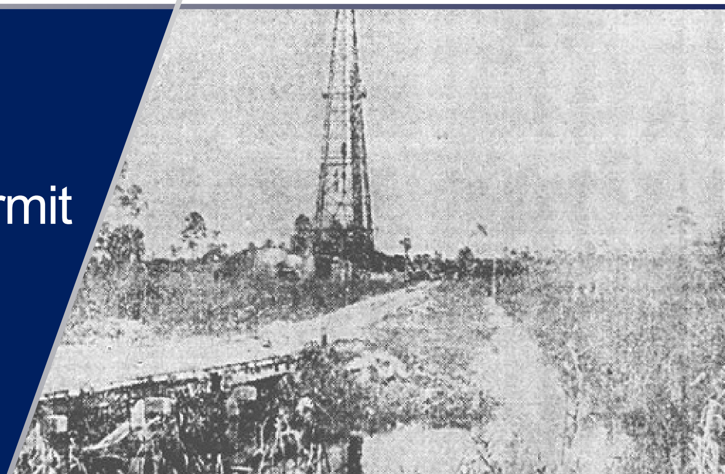
Application for an United States Environmental Protection Agency Class II Injection Well Construction Permit

Tamiami Prospect
Collier County, Florida



PREPARED FOR:

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APRIL 2021

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APRIL 2021

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EXHIBIT 3. Authorization to Transact Business in the State of Florida

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SUMMARY

The purpose of this application is to obtain a new Class II Injection Well permit for saltwater disposal at the Tamiami Prospect project site. The United States Environmental Protection Agency Underground Injection Control Program Class II Permit Application Completeness Review Checklist is presented as ***Exhibit 1***. This report documents all the items required for a complete application. The proposed saltwater disposal well will be drilled, subject to final approval by the National Parks Service, at approximately W080° 52' 46.03" Longitude, N025° 58' 56.65" Latitude and will be used to dispose of approximately 0.54 million gallons per day (MGD) of oil well construction and production related brines into the Boulder Zone of the Eocene Oldsmar Formation. Site location maps are provided in ***Figures 1*** and ***2***.

In addition to this application, a general water use permit application for potable supply and an individual water use permit application for industrial use have been submitted to the South Florida Water Management District for this project. Permit applications for the construction of a Class II Injection Well has been concurrently submitted to the Florida Department of Environmental Protection.

AREA OF REVIEW

1.0 PURPOSE

The purpose of this application is to obtain a new Class II Injection Well permit for saltwater disposal at the Tamiami Prospect project site. The proposed saltwater injection well will be used to dispose of approximately 0.54 MGD of oil well construction and production related brines into the Boulder Zone of the Eocene Oldsmar Formation. The United States Environmental Protection Agency Underground Injection Control Program Class II Permit Application Completeness Review Checklist is presented as ***Exhibit 1*** and documents all the materials required for a complete application. The United States Environmental Protection Agency permit application for a Class II Well (United States Environmental Protection Agency Form 7520-6 [Rev. 4-19]) is provided as ***Exhibit 2***.

2.0 CONFIDENTIALITY

All information regarding this well other than the supplemental documents supplied for permit application enclosed here for review are to be held **CONFIDENTIAL**. The information that is requested to be held confidential should include, but is not limited to: drilling reports, geological and geophysical well logging information, test results, production reports, and any geologic interpretations relative to this application submittal by the permittee and/or authorized representatives.

3.0 APPLICANT/OPERATOR

The applicant/operator is Burnett Oil Co., Inc. A copy of the Burnett Oil Co., Inc. authorization to transact business in the state of Florida is provided as ***Exhibit 3***. ***Exhibit 3*** contains: (1) the Burnett Oil Co. Inc. 2020 Foreign Profit Corporation Annual Report; (2) the Corporate filing with the Florida Department of State allowing Burnett Oil Co. Inc. to conduct business in Florida; and (3) Memorandum of Oil and Gas Lease between Collier Resource Company LLC (Owner/Lessor) and Burnett Oil Co. Inc. (Lessee). The principal address of Burnett Oil Co., Inc. is:

Principal Address: Burnett Plaza
Suite 1500
801 Cherry Street, Unit No. 9
Fort Worth, Texas 76102-6881

4.0 AUTHORIZED AGENT

Water Science Associates, Inc. (Water Science Associates), 13620 Metropolis Avenue, Suite 110, Fort Myers, Florida 33912 is the authorized consultant for the preparation of this application. A letter signed by the applicant which authorizes Water Science Associates to submit this application is provided as ***Exhibit 4***.

5.0 WELL NAME

The saltwater disposal well to be drilled is named “Tamiami SWD#1”. The well will provide a means for the disposal of excess brines generated during construction of the proposed oil wells and during oil production and will target the Eocene Oldsmar Formation, specifically the Boulder Zone.

6.0 WELL LOCATION AND PERMITTED AREA DESCRIPTION

Title 40 Code of Federal Regulations (CFR) Chapter (§)144.26; §144.33: For Individual Permits

If the surface location provided in the accompanying 7520-6 form does not adequately describe the well location (i.e., due to deviation, directional, or horizontal drilling), please describe the well's orientation and provide the top- and bottom-hole coordinates, as appropriate. If any monitoring wells are proposed as part of this permit application, provide coordinates for all monitoring wells.

As required by Title 40 CFR §144.26; §144.33, this section provides the well location and permitted description.

Tamiami SWD#1 will be drilled, subject to final approval by the National Parks Service, at approximately W080° 52' 46.03" Longitude, N025° 58' 56.65" Latitude. A copy of the well plat is provided as ***Exhibit 5***. ***Figure 1*** documents the well location on the North of Fiftymile Bend, Florida U.S. Geological Survey (USGS) quadrangle (ESRI, 2020[1]), while ***Figure 2*** is an aerial depiction of the well location based on the well plat.

7.0 AREA IF REVIEW SIZE DETERMINATION

Title 40 CFR §146.6: Area of Review Size Determination

For All Permits. Give the method (fixed radius or equation) and, if appropriate, all calculations used to determine the size of the area of review (AOR). If you are uncertain as to which method to use, consult with your regional EPA office.

The AOR must be a minimum radius of one-fourth (1/4) mile from the well bore, including a well's lateral, or the proposed area permit boundary for area permits, unless the use of an equation is approved by the Director.

In addition, for Class II enhanced oil recovery well(s). The AOR will be at a minimum the larger of the following: one-fourth (1/4) mile radius or the distance to the nearest active producer in the production formation.

The anticipated maximum injection rate is approximately 0.54 MGD for disposal of oil well construction and production related brines. Per Title 40 CFR §144.6, this section estimates the area of review assuming homogeneous and isotropic conditions within the injection zone (Eocene Oldsmar Formation, specifically the Boulder Zone) and forty years of injection, which is the estimated lifespan of the prospect.

$$\mathbf{V} = \boldsymbol{\pi}\mathbf{r}^2\mathbf{b}\mathbf{n}_\mathbf{e}$$

Where:

V: the volumetric extent of the injected fluids;
r: radius;
b: thickness of the productive portion of the injection zone (500 feet); and
n_e: effective porosity (n_e = 0.2 [maximum allowed by Florida Department of Environmental Protection]).

Rearranging the equation:

$$\mathbf{r}^2 = \frac{\mathbf{V}}{\boldsymbol{\pi}\mathbf{b}\mathbf{n}_\mathbf{e}}$$

[1] ESRI (2020) ArcGIS.

Therefore, assuming forty years of the estimated injected fluid volume:

$$r^2 = \frac{1{,}054{,}783{,}901 \text{ cubic feet}}{\pi(500 \text{ feet})(0.2)}$$

r, the estimated lateral extent of the estimated injected fluid volume over forty years, equals 1,832.34 feet, which is less than the one-mile radius required by §62-528.300(4), F.A.C. for the Area of Review. To be conservative, one-half mile will be used herein as the Area of Review (***Figure 3***).

8.0 MAPS

> *Title 40 CFR §144.31; §146.24: Maps*
>
> *Submit a topographic map (or other map if a topographic map is unavailable) extending one mile beyond the facility property boundary showing:*
>
> - *project injection well(s), well pad(s) and/or project area,*
> - *applicable area of review,*
> - *all outcrops of injection and confining formations,*
> - *all surface water intake and discharge structures, and*
> - *all hazardous waste treatment, storage, or disposal facilities.*
>
> *Consult with your EPA regional office for the definition of the facility property boundary.*
>
> *The information below does not apply to existing rule authorized Class II well(s).*
>
> *Within the one-fourth (1/4) mile beyond the facility property boundary or the AOR, whichever is larger, the map will also show the:*
>
> - *name and location of all production wells, injection wells, abandoned wells, dry holes, and all water wells, noting their types (public water system, domestic drinking water, stock, etc.),*
> - *springs and surface bodies of water,*
> - *mines (surface and subsurface) and quarries, and*
> - *other pertinent surface features, including residences, schools, hospitals, and roads.*
>
> *Only information of public record and pertinent information known to the applicant is required to be included on this map. Multiple maps may be needed to display this information clearly. If a certain feature is not present in the area covered, please state so definitively (e.g., "There are no known outcrops of the confining formation in the mapped area.").*

Figure 4 is a topographic map presenting the following information: project injection well(s), well pad(s) and/or project area; applicable area of review; all outcrops of injection and confining formations; all surface water intake and discharge structures; and all hazardous waste treatment, storage, or disposal facilities. Unlike most of the U.S., South Florida does not have many formations cropping out. There are no known outcrops within one-half mile of the project site. Furthermore, based on a thorough review of the South Florida Water Management District and the Florida Department of Environmental Protection geospatial data portals (South Florida Water Management District 2020[2,]; Florida Department of Environmental Protection 2020[3]), there are no surface water intake and discharge structures or hazardous waste treatment, storage, or disposal facilities within one-half mile of the project site.

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[2] South Florida Water Management District Geospatial Data (2020) https://geo-sfwmd.hub.arcgis.com/
[3] Florida Department of Environmental Protection Geospatial Data (2020) https://geodata.dep.state.fl.us/

Figure 5 is a topographic map presenting the following information: all production wells, injection wells, abandoned wells, dry holes, and all water wells, noting their types (public water system, domestic drinking water, stock, etc.); springs and surface bodies of water; mines (surface and subsurface) and quarries and other pertinent surface features, including residences, schools, hospitals, and roads. Based on a thorough review of the South Florida Water Management District, the Florida Geological Survey, and the Florida Department of Environmental Protection geospatial data portals (South Florida Water Management District 2020; Florida Geological Survey 2020[4]; Florida Department of Environmental Protection 2020), there are no oil/gas production wells; injection wells; abandoned wells; dry holes; permitted water wells; springs and surface bodies of water; mining activity; or and other pertinent surface features, such as residences, schools, or hospitals, within one-half mile of the project site.

9.0 AREA OF REVIEW WELLS AND CORRECTIVE ACTION PLAN

Title 40 CFR §144.55; §146.24: Area of Review Wells and Corrective Action Plans

Submit a tabulation of data and wellbore diagrams reasonably available from public records or otherwise known to the applicant on all wells within the AOR included on the map, which penetrate the proposed confining zone(s). Such information will include:

- *well name, location and depth,*
- *well type,*
- *date well was drilled,*
- *well construction that includes casing and cement details, including demonstrated or calculated top of cement,*
- *cement bond logs (if available), and*
- *record of well completion and plugging (if applicable).*

For such wells which are improperly sealed, completed, or abandoned, also submit a plan consisting of such steps or modifications as are necessary to prevent movement of fluid into USDWs.

Within the Area of Review (one-half mile from the Tamiami Prospect project site) and as noted on ***Table 1***, there are no oil and/or gas wells based on data obtained from the Florida Geological Survey and the Florida Department of Environmental Protection geospatial data portals (Florida Geological Survey 2020[5]; Florida Department of Environmental Protection 2020; ***Figure 5***).

Data for shallow water wells within one-half mile from the Tamiami Prospect project site were downloaded as an ArcGIS shapefile from the South Florida Water Management District, a publicly available database. As noted on ***Table 2***, there are no shallow water wells identified within the Area of Review.

10.0 LANDOWNER INFORMATION

Title 40 CFR §144.31 AND PART 147: Landowner Information

Identify and submit a list with the names and addresses of all owners of record of land within one-fourth (1/4) mile of the facility property boundary. This requirement may be waived by the Regional Administrator if the site is in a populous area and the Regional Administrator determines that the requirement would be impracticable.

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[4] Florida Geological Survey (2020) Geospatial Open Data https://geodata.dep.state.fl.us/search?q=geology&sort=-modified

[5] Florida Department of Environmental Protection (2020) Interactive Map https://ca.dep.state.fl.us/mapdirect/?focus=standard

A list of the landowners within one-fourth mile of the proposed saltwater disposal well is provided as ***Table 3*** and depicted on ***Figure 6***. The data were collected from Collier County Property Appraiser.

Title 40 CFR §146.24: Geological Data

Provide the following information:

- *geological data on all formations from the surface to the base of the injection well, identifying all USDWs and confining and injection zone(s). This data includes the lithologic description, geological name, thickness, depth, and total dissolved solids (TDS) concentrations from these formations (if known),*
- *source of information for the geologic data and formation TDS,*
- *porosity and permeability of injection formation (if available),*
- *geological cross-sections (if available) proximate to the injection well that includes the confining and injection zones. The cross-sections should illustrate the regional geologic setting and show the thickness and lateral continuity of the confining zone(s) through the area of review,*
- *within the AOR, identify known or suspected faults and fracture systems. If identified, provide proximity to the injection zone and the effect the fault/fracture system may have on the injection activities, and*
- *a history of seismic activity in the area and proximity to crystalline (i.e., granitic) basement.*

1.0 REGIONAL GEOLOGY

The regional geology section was developed from a literature review of prior geologic investigations and reports and is intended to provide a context for understanding the geology of the area where the proposed saltwater disposal well will be located.

1.1 Regional Geomorphology

The Florida Platform occurs entirely within the Eastern United States Coastal Plain physiographic province as defined by Fenneman (1938[6]). Florida's geomorphic features are the result of the complex interaction of tectonic, depositional, erosional and karst processes. The sediments and rocks that comprise Florida's near-surface geologic framework include sand, silt, clay, limestone and dolostone. These sediments were predominantly deposited under marine conditions when sea levels were higher, covering the state. In addition to marine deposition, some sediments were also deposited by rivers, streams and/or wind. Sea level fluctuations, occurring over millions of years, both deposited new sediments and eroded older sediments. The result is the variable distribution of geologic formations as can be seen on the geologic map of Florida (Scott et al. 2001[7]) and in the distribution of geomorphic features (Puri and Vernon 1964[8]).

Collier County makes up part of the Distal or Southern geomorphic zone, which is characterized by insoluble clastic sediments forming relict beach ridges, barriers, dunes and other littoral features (White 1970[9]). Collier County is located within the Everglades Geomorphic District (Scott

[6] Fenneman NM (1938) Physiography of eastern United States. New York, McGraw-Hill.
[7] Scott TM, Campbell KM, Rupert FR, Arthur JD, Missimer TM, Lloyd JM, Yon JW, and Duncan JG (2001) Geologic Map of the State of Florida. Florida Geological Survey, Map Series No. 146.
[8] Puri HS and Vernon RO (1964) Summary of the Geology of Florida and Guidebook to the Classic Exposures. Florida Geological Survey Special Publication No. 5 (revised).
[9] White WA (1970) The geomorphology of the Florida peninsula. Florida Bureau of Geology, Bulletin 51.

2005[10]; Williams et al. In Prep[11]; ***Figure 7***). The Everglades Geomorphic District covers the southern one-third of the Florida peninsula and includes the Florida Keys. The district extends from the Atlantic Coast to the Gulf Coast and incorporates Florida Bay. The northern boundary roughly follows the Caloosahatchee River Valley eastward from the Gulf Coast to the northern edge of Lake Okeechobee. The boundary then follows the northern shoreline of the lake, then trends southeasterly into Palm Beach County toward the Atlantic Coast at Palm Beach. The Everglades Geomorphic District lies south of the Sarasota River Geomorphic District on the west and north, the Central Lakes Geomorphic District on the north and the Barrier Island Sequence Geomorphic District on the north and east. The boundaries are gradational in nature as can be easily recognized on satellite photographs. The geomorphic features recognized in Collier County are, from west to east, the Big Cypress Province, the Immokalee Rise Province, and the Everglades Province.

1.1.1 Big Cypress Province

The project site is located within the Big Cypress Province. The Big Cypress Province includes the Big Cypress Swamp, Corkscrew Swamp, and the other ridge and slough (also referred to as "strands") regions from the Gulf coast north of Naples and east towards the Everglades marshlands. The Province boundary is the drainage divide between the Caloosahatchee River and the Gulf Coast at Estero Bay and Six Mile Slough. The Province is bound on the north by the Immokalee Rise Province and to the east by the Everglades Province (Scott 2005). A portion of the Province is bound on the northwest by the Rock Glades Province (Scott 2005). The southern and western boundary of the Big Cypress Province abuts the Ten Thousand Islands Province (Scott 2005), where the cypress swamps and mangroves of the mainland transition to offshore mangrove islands and bays. The Province is slightly higher in elevation than the Everglades Province to the east and slightly lower in elevation than the Immokalee Rise Province to the north-northeast. Elevations within the Big Cypress Province range from 5 to about 20 feet National Geodetic Vertical Datum.

Sheet flow in the Province is predominantly to the south and southwest towards the Gulf of Mexico through sloughs and canals constructed throughout the 20th century. The majority land area of the Province is the Big Cypress Swamp. At low water, drainage of the Province was largely through the cypress strands, which were separated by low, winding ridges. At high water, overland flow dominated and, prior to development, many of the ridges were flooded. Large areas of the Big Cypress Swamp were logged for cypress and some minor areas were developed with roads for residential subdivisions. Over the years, many attempts were made to develop this area and resulted in a network of canals, including several main-stem canals, such as the Faka Union. The area is now government preserve land. South of the Province boundary, the water table is near land surface and drainage is primarily through cypress sloughs between ridges towards the Gulf Coast.

[10] Scott TM (2005) Revisions to the geomorphology of Florida focusing on north-central Florida and the eastern Panhandle. In R. Copeland (Compiler), Geomorphic Influence of Scarps in the Suwannee Basin, Southeastern Geological Society Field Trip Guidebook 44, pp. 18-36.

[11] Williams CP, Scott TM, Upchurch SB, Paul DT, and Hannon LM (n.d.) (In Prep.) Florida geomorphology, Fla Geol Surv Bull 72.

1.2 Regional Stratigraphy/Lithology

Carbonate sedimentation dominated during the Paleogene Period and into the earliest Neogene Period on much of the Florida Platform. A significant change in sedimentation occurred in the early Neogene. Siliciclastic sediments began to replace carbonates as the dominant sediment.

1.2.1 Paleogene Period

Carbonate and evaporite deposition enveloped much of the Florida Platform during the Paleocene Epoch (Miller 1986[12]). The carbonate and evaporite sediments graded to the northwest into shallow marine fine-grained siliciclastic sediments across the Georgia Channel System. The main carbonate-producing area was interpreted as being rimmed by a reef system, which restricted flow of seawater into and out of the area, an environment necessary for evaporite deposition (Winston 1991[13]). The Paleocene sediments cover the entire Florida Platform and have a maximum thickness of more than 2,200 feet. The thick anhydrite beds in the Paleocene Cedar Keys Formation form the regionally extensive lower confining unit of the Floridan aquifer system (Miller 1986,1997[14]).

The evaporite content of the Lower to Middle Eocene sediments declined in response to sea-level rise and resulted in the development of a more open, carbonate-ramp depositional system on the platform. Evaporites occur primarily as pore fill (Miller 1986). The carbonate sediments grade into siliciclastic sediments in the Georgia Channel System (Miller 1986). The Lower to Middle Eocene sediments (Oldsmar and Avon Park formations) cover the entire platform, ranging to maximum thickness of more than 3,100 feet. Middle Eocene Avon Park Formation is the oldest sediments exposed on the platform (Scott et al. 2001). These sediments are exposed on the crest of the Ocala Platform.

Carbonate deposition covered virtually the entire Florida Platform in the Late Eocene. Carbonates were deposited even to the north of the Georgia Channel System nearly to the Fall Line (limit of Cretaceous onlap), beyond the limits of the Florida Platform. The carbonate ramp had a well-developed slope with no vestige of a rim to restrict seawater flow. The Upper Eocene carbonates grade into siliciclastics on the northwestern-most part of the platform. These carbonates range in thickness to more than 700 feet but are absent in several areas of the platform due to erosion (Miller 1986; Scott 1992[15],2001[16]). In a large area on the southern part of the platform, the Upper Eocene sediments are absent, probably due to erosion by sea currents. On the areas of the platform where the Oligocene Suwannee Limestone is absent, the Late Eocene Ocala Limestone form the upper portion of the Floridan aquifer system (Miller 1986,1997).

Lower Oligocene carbonate deposition occurred as far landward as did the Upper Eocene deposition. The carbonates grade into siliciclastics on the northwestern-most part of the platform. Very minor amounts of siliciclastics are incorporated into these carbonates; however, beds of fine quartz sand occur in the Oligocene Suwannee Limestone of southern Florida (Missimer 2002[17]).

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[12] Miller JA (1986) Hydrogeologic framework of the Floridan Aquifer System in Florida, and in parts of Georgia, Alabama and South Carolina. U. S. Geological Survey Professional Paper 1403-B, 91 p., 33 plates.
[13] Winston GO (1991) Atlas of Structural Evolution and Facies Development on the Florida-Bahama Platform – Triassic through Paleocene. Miami Geological Society, 39 p.
[14] Miller JA (1997) Hydrogeology of Florida. In A.F. Randazzo and D.S. Jones (Eds.), The Geology of Florida, Gainesville, FL, The University Presses of Florida, pp. 69-88.
[15] Scott TM (1992). A geological overview of Florida. Florida Geological Survey Open File Report 50, 78 p.
[16] Scott TM (2001) Text to accompany the geologic map of Florida. Florida Geological Survey, Open-file Report 80.
[17] Missimer TM (2002) Late Oligocene to Pliocene Evolution of the Central Portion of the South Florida Platform: Mixing of Siliciclastic and Carbonate Sediments. Florida Geological Survey Bulletin 65, 184 p., 6 plates.

Whether or not the carbonate deposition covered the platform is debatable. The Oligocene Suwannee Limestone ranges in thickness to more than 700 feet but are absent over large portions of the platform (Miller 1986; Scott 1992, 2001). These sediments are missing due to nondeposition or erosion, or both, in a large area on the eastern flank of the Ocala Platform in an area referred to as the "paleo-Orange Island" (Bryan 1991[18]).

Chert (silicified limestone) occurs in the upper portion of the Middle Eocene through the Lower Oligocene carbonates. The chert itself formed long after the carbonates were deposited, as the result of the weathering of the overlying clay-rich Miocene sediments that covered the platform (Scott 1988[19]). Weathering of the clays releases large amounts of silica into the groundwater and, in the appropriate geochemical environment, replaces limestone. Fossils including foraminifera and corals are often preserved in the chert.

Sea regression in the Late Oligocene restricted deposition to portions of southern and northwestern Florida (Missimer 2002). Although absent over much of the platform, these sediments may exceed 440 feet in thickness (Braunstein et al. 1988[20]). The stratigraphic section in southern Florida may represent the most complete Upper Oligocene section in the southeastern United States (Brewster-Wingard et al. 1997[21]).

1.2.2 Neogene Period to Quaternary Period

Significant depositional changes occurred in the late Paleogene-early Neogene. Several factors were responsible for the changes including epeirogeny in the Appalachians that took a highly eroded and reduced mountain range and uplifted it (Stuckey 1965[22]; Schlee et al. 1988[23]; Gallen et al. 2013[24]). The Appalachians range again became a source of sediment, due to increased erosion, and the siliciclastic sediments were transported downslope by streams and rivers. Marine currents transported the sediment southward onto the Florida Platform. Sea level rose through the Middle Miocene then began significantly fluctuating until the end of the Pleistocene and rose in the Holocene to present sea level.

Initially, in the Early Miocene, the Hawthorn Group was deposited interbedded and mixed with carbonates in northern Florida, while carbonates continued to dominate in southern Florida (Scott 1988). By the Middle Miocene, with continued sea level rise, siliciclastic deposition generally replaced carbonate deposition (Scott 1988; Missimer 2002). During this period, carbonate deposition continued only in the southernmost portions of the platform, while siliciclastic sediments continued to be transported further south and, ultimately, dominated the deposition system on most of the Florida Platform by the Early Pliocene. Carbonates continued to be produced, but on a much more limited scale. In the late Neogene, carbonates most often occurred solely as a matrix in between the siliciclastic grains. Siliciclastic sediments encroached onto the

[18] Bryan JR (1991) Stratigraphic and palaeontologic studies of Paleocene and Oligocene carbonate facies of the eastern Gulf Coastal Plain. Ph.D. dissertation, University of Tennessee, Knoxville, TN, 324 p.
[19] Scott TM (1988) The lithostratigraphy of the Hawthorn Group (Miocene) of Florida. Fla Geol Surv Bull 59.
[20] Braunstein J, Huddlestun P, and Biel R (1988) Gulf Coast Region, Correlation of Stratigraphic Units of North America (COSUNA) Project. American Association of Petroleum Geologists, 1 plate.
[21] Brewster-Wingard GL, Scott TM, Edwards LE, Weedman SD, and Simmons KR (1997) Reinterpretation of the peninsular Florida Oligocene: An integrated stratigraphic approach: Sedimentary Geology, 108:207-228
[22] Stuckey JL (1965) North Carolina: Its geology and mineral resources: North Carolina Department of Conservation and Natural Resources, 550 p.
[23] Schlee JS, Manspeizer W, and Riggs SR (1988) Paleo-environments: Offshore Atlantic U.S. margin. In R.E. Sheridan and J.A. Grow, The Atlantic Continental Margin, The Geology of North America, Geological Society of America, Vol. I-2, pp. 365-385.
[24] Gallen SF, Wegmann KW, and Bohnensteih DR (2013a) Miocene rejuvenation of topographic relief in the southern Appalachians. GSA Today, 23(2):4–10

southernmost portion of the platform during the Pliocene forming the foundation for the northern half of the Florida Keys (Cunningham et al. 1998[25]). In the Quaternary, siliciclastics dominated over much of the platform. However, in the late Quaternary, with a reduction in siliciclastic supply, carbonate deposition began to occur over portions of the southernmost portion of the Florida Platform.

Sediments deposited during the Miocene covered the entire platform; however, subsequent erosion and redeposition created the distributional pattern seen today (Scott et al. 2001). The initial distribution of Pliocene sediments is not known but can be inferred to have been more extensive than the present occurrence (Scott et al. 2001). Unusual depositional environments are also recorded on the Florida Platform in the late Cenozoic (Neogene) as the result of sea-level fluctuations and marine upwelling of bottom waters. Major phosphorite and palygorskite deposits formed as the result of these conditions (Weaver and Beck 1977[26]; Riggs 1979[27]; Scott 1988; Compton 1997[28]). The age of the phosphorites indicate that the phosphogenic environment occurred in the Early and Middle Miocene. The peri-marine environments where the palygorskite deposits formed also occurred during the Miocene in northwestern Florida (Weaver and Beck 1977). Palygorskite also formed in alkaline lakes in the western-central part of the peninsula in association with sea level fluctuation.

In the late Neogene and into the Quaternary, climate and depositional conditions allowed the development of extremely fossiliferous molluscan-bearing lithologic units. Some of the formations defined within the late Neogene and early Quaternary contain some of the most diverse faunas in the world. How these units formed has been debatable (Allmon 1992[29]). Due to the abundance and diversity of the molluscan fossils, paleontologists have been drawn to study these sediments for more than a century (Scott 1997[30]).

As sea level rose in the Pleistocene, sediments were deposited over that portion of the platform that is below 60 to 100 feet National Geodetic Vertical Datum. The Pleistocene sea level rose no higher than this level (Colquhoun et al. 1968[31]). The rising sea level in the late Pleistocene and increased carbonate production on the southern portion of the platform allowed for the development of Miami Limestone, a broad carbonate bank and oolite shoal complex, and Key Largo Limestone, the paleo-reef tract of Florida Keys. The Neogene-Quaternary sediments range from a negligible thickness to more than 3,000 feet in thickness (Miller 1986).

During the last glacial stage of the Pleistocene, sea level dropped approximately 400 feet exposing vast portions of the Florida Platform that are presently beneath marine waters of the Gulf and Atlantic Ocean. Stream and river channels that can be seen on bathymetric maps provide

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[25] Cunningham K, McNeill D, Guertin L, Ciesielski P, Scott TM, and de Verteuil L (1998) New Tertiary stratigraphy for the Florida Keys and southern peninsula of Florida. Bulletin, Geological Society of America, 110(2):231-258.
[26] Weaver CE and Beck KC (1977) Miocene of the Southeastern United Sates: A Model for Chemical Sedimentation in a Peri-Marine Environment. Amsterdam, Elsevier Scientific Publishing Company, Developments in Sedimentology, Vol. 22, 233 p. and Sedimentary Geology, 17:1-234.
[27] Riggs SR (1979) Phosphorite sedimentation in Florida – a model phosphogenic system. Economic Geology, 74:285-314.
[28] Compton JS (1997) Origin and paleogeographic significance of Florida's phosphorite deposits. In Randazzo AF and Jones DS (Eds.), The Geology of Florida, University Press, Gainesville, FL, pp. 195-216
[29] Allmon, WD (1992) Whence southern Florida's Plio-Pleistocene shell beds? In Scott TM and Allmon WD (Eds.), Plio-Pleistocene Stratigraphy and Paleontology of Southern Florida. Florida Geological Survey Special Publication 36, pp.1-20
[30] Scott TM (1997) Miocene to Holocene history of Florida. In Randazzo AF and Jones DS, The Geology of Florida, University Press of Florida, Gainesville, pp. 57-67.
[31] Colquhoun DJ, Herrick SM, and Richards HG (1968) A fossil assemblage from the Wicomico Formation in Berkeley County, South Carolina. Bull Geol Soc Amer, 79:1211–1220.

evidence for erosion during sea level low stands. Archeological sites dated between 8,000 and 6,000 years before present (BP) are found offshore in the Florida Big Bend (Faught and Donoghue 1997[32]).

Davis (1997[33]) stated that approximately 3,000 years BP the sea level was not significantly lower than the present sea level. Davis believes that much of the present-day coastline formed during the last 3,000 years as the result of the relatively stable sea-level conditions. The Florida Everglades formed during this general time frame through the deposition of mangrove peat and freshwater calcitic mud covering a broad expanse of Miami Limestone.

Regional geologic cross-sections for Collier County (modified from Reese 2000[34]) oriented east-west and southeast-northwest are presented on ***Figures 8*** and ***9***, respectively.

1.3 Structural Geology

Geologic structures are rock deformations (folds or faults) caused by tectonic movements of the Earth's crust and other processes that cause stress and strain in rock. Some of Florida's geologic "structures" are features caused by erosion of pre-existing surfaces. The Florida Platform has been a relatively stable portion of the trailing edge of the North American Plate since the Middle Jurassic with little to no seismic activity. Winston (1991) indicated that the Mesozoic and Cenozoic Era structural movement on the Platform was totally downward. Florida's arches were not formed by uplift, rather, the result of subsiding more slowly than the flanking basins. However, faulting of the basement rocks created many of the structural features recognized on the pre-Middle Jurassic surface (Barnett 1975[35]; Smith and Lord 1997[36]).

Faults disrupting the upper Jurassic sediments have been identified in northwestern Florida; some fault displacements exceed 1,000 feet (Lloyd 1989[37]). Miller (1986) recognized several known or suspected Cenozoic faults that affect the Floridan aquifer system. (Note: The Floridan aquifer system is discussed in detail in ***Section B 2.0 Generalized Hydrostratigraphy of Southwestern Florida***.) Duncan et al. (1994[38]) identified faulting in the Lower to Middle Eocene Oldsmar Formation. Several hydrogeologic and geomorphic investigations have proposed the existence of faults (Wyrick 1960[39]; Leve 1966[40]; Lichtler et al. 1968[41]; Pirkle 1970[42]; White 1970). The faults in the Cenozoic section have very limited displacement, generally less than 100 feet and are

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32 Faught MK Donoghue JF (1997) Marine inundated archaeological sites and paleofluvial systems: Examples from a karst-controlled continental shelf setting in Apalachee Bay, northeastern Gulf of Mexico. Geoarchaeol 12(5):417–458.
33 Davis RA Jr (1997) Geology of the Florida coast. In: Randazzo AF Jones DS (eds) The geology of Florida, Univ Press Flor, Ch 10, pp. 155–168.
34 Reese RS (2000) Hydrogeology and the Distribution of Salinity in the Floridan Aquifer System, Southwestern Florida: US Geol Surv Water Inves Rept 98- 4253.
35 Barnett RS (1975) Basement structure of Florida and its tectonic implications. Transactions of the Gulf Coast Association of Geological Societies, Vol. 25, pp. 122-142.
36 Smith DL and Lord KM (1997) Tectonic evolution and geophysics of the Florida basement. In A.F. Randazzo and D.S. Jones (Eds.), The Geology of Florida. Gainesville, The University Presses of Florida, pp. 13-26.
37 Lloyd JM (1989) 1986, and 1987 Florida petroleum production and exploration. Florida Geological Survey Information Circular 106, 39 p.
38 Duncan JG, Evans III WL, and Taylor KL (1994) Geologic Framework of the Lower Floridan Aquifer System, Brevard County, Florida. Florida Geological Survey Bulletin 64, 90 p.
39 Wyrick GG (1960) The Ground Water Resources of Volusia County, Florida. Florida Geological Survey Report of Investigations 22, 65 p.
40 Leve GW (1966) Ground water in Duval and Nassau Counties, Florida. Florida Geological Survey Report of Investigations No. 43, 91 p.
41 Lichtler WF, Anderson W, and Joyner BF (1968) Water Resources of Orange County, Florida. Florida Geological Survey Report of Investigations No. 50, 150 p.
42 Pirkle WA (1970) The offset course of the St. Johns River, Florida. Southeastern Geology, 13:39-59.

difficult to identify due to limited displacement, well control, few “marker” beds, erosional disconformities, and/or karstification of the carbonate materials.

There have been few references documenting the folding of post-Middle Jurassic sediments on the Florida Platform. Missimer and Maliva (2004[43]) believe that folding is more widespread on the Florida Platform than is presently recognized, due to the limited amount of detailed subsurface data. They recognized folding with associated fracturing and faulting in the sediments of the intermediate aquifer system/confining unit, which is predominantly comprised of Miocene to Pliocene sediments, and the Floridan aquifer system, which predominantly comprises Eocene to Oligocene sediments, on the southern portion of the platform. They postulated that the interaction of the Caribbean and North American plates in the Late Miocene to Pliocene produced the folds, fractures, and faults (Missimer and Maliva 2004).

The oldest features recognized as affecting deposition of post–Middle Jurassic sediments on the platform are expressed on the pre–Middle Jurassic surface (Arthur 1988[44]). The Mesozoic structural features affecting deposition of sediments include a series of basins or embayments and arches. Some of these features affected deposition into the middle Cenozoic. Other features affected the deposition into the late Cenozoic. The Peninsular Arch affected deposition from the Middle Jurassic through the Cretaceous and periodically stood above sea level during the Cenozoic (Miller 1986).

One of the more interesting structural features of the Florida Platform is a southwest-to-northeast trending low that has affected deposition from the Middle Jurassic until at least the Middle Miocene. Some portions of the feature continued to affect deposition through the Pleistocene. This feature has an extended list of names that have been applied to all or parts of it. An excellent review of the names applied to the feature was presented by Schmidt (1984[45]) and Huddlestun (1993[46]). However, Georgia Channel System is the name that has been applied to the entire sequence (Huddlestun 1993).

The Georgia Channel System had its origin in the formation of the South Georgia Rift in the Triassic to Jurassic(?) (Huddlestun 1993). From the late Cretaceous through the Paleocene, this area was the boundary between carbonate deposition to the south and siliciclastic deposition to the north. By the Eocene, the Appalachian Mountains had been highly eroded leaving relatively low hills and significantly reduced siliciclastic sediment transport via streams and rivers. In the Eocene and Oligocene, as the result of a greatly reduced siliciclastic supply, carbonate deposition extended across the Georgia Channel System. The channel system was then infilled by predominantly siliciclastic sediments in the Late Oligocene to the Early Miocene in response to uplift in the Appalachians (Scott 1988). Gallen et al. (2013) postulated that geomorphic changes in the southern Appalachians resulted from a “post-orogenic regional uplift in the Miocene.” This rejuvenation would have resulted in a large volume of siliciclastic sediments reaching the marine environment in the southeastern United States and spilling over into Florida. This influx of

[43] Missimser TM and Maliva RG (2004) Tectonically induced fracturing, folding and groundwater flow in south Florida. Gulf Coast Association of Geological Societies Transactions, 54:443-459.
[44] Arthur JA (1988) Petrogenesis of the Early Mesozoic Tholeiite in the Florida Basement and an Overview of Florida Basement Geology. Florida Geological Survey Report of Investigation No. 97, 39 p.
[45] Schmidt W (1984) Neogene stratigraphy and geologic history of the Apalachicola Embayment, Florida. Florida Geological Survey Bulletin 58, 146 p.
[46] Huddlestun PF (1993) A revision of the Lithostratigraphic Units of the Coastal Plain of Georgia: the Oligocene. Georgia Geologic Survey Bulletin 105, 152 p., 5 plates.

siliciclastic sediments was a crucial event in Florida's geologic and karstic history, the Miocene siliciclastics being a key element in Florida's karst.

Figure 10 depicts literature referenced regional faults. The closest fault zone to the project site is the Sunniland Fracture Zone, which is a left-lateral strike-slip fault cutting through Triassic-Jurassic formations (Christenson 1990[47]) In reviewing the most recent short-term induced seismicity models, the USGS estimated a less than 1 percent chance of seismic activity in 2018 for the State of Florida, whereas the 2018 United States (Lower 48) Seismic Hazard Long-term Model ranks the State of Florida as the lowest hazard (USGS 2018[48],2019[49]).

2.0 GENERALIZED HYDROSTRATIGRAPHY OF SOUTHWESTERN FLORIDA

The Cenozoic sediments of Florida form a series of aquifer systems, which provide greater than 90 percent of the drinking water and about 60 percent of all water used in the state (Berndt et al. 1998[50]; Marella 2009[51]; Upchurch et al. 2019). The prominent aquifer systems in Florida include: the Floridan; Intermediate; and Surficial aquifer systems (Southeastern Geological Society 1986[52]). Each system is briefly discussed in the following sections.

2.1 Surficial Aquifer System

Starting at land surface, the surficial aquifer system in southwestern Florida includes the water table aquifer, confining beds, and the Lower Tamiami Aquifer. The system regionally ranges in thickness from 45 to 320 feet in south Florida (Reese 2000) but is typically under 150 feet. The water table aquifer is comprised of highly permeable, interbedded carbonates and siliciclastics, which underlie some of the most populous metropolitan areas in Florida (Upchurch et al. 2019). The aquifer is unconfined and occurs in the undifferentiated sediments and the upper part of the late Miocene-Pliocene Tamiami Formation. In some parts of south Florida, undifferentiated sediments of significant thickness are absent, and the water table aquifer occurs within the late Miocene-Pliocene Tamiami Formation (Scott 2001 and Missimer 1992[53]). The late Miocene-Pliocene Tamiami Formation is a poorly defined lithostratigraphic unit containing a wide range of mixed carbonate-siliciclastic lithologies and associated faunas. The formation thickness is generally less than 60 feet and is comprised of highly transmissive to impermeable sandy, shelly limestone and calcareous sandstone creating a relatively complex aquifer (Reese 2000). As indicated above, in some areas of south Florida, it is part of the surficial aquifer system, while in others, it is part of the intermediate confining unit/aquifer system. The permeable limestone of the Tamiami Formation is considered by the South Florida Water Management District to be the Lower Tamiami Aquifer in parts of southwest Florida where confinement exists above the limestone and beneath the undifferentiated surficial sediments. The base of the surficial aquifer system occurs at the top of the laterally extensive and vertically persistent lower-permeability

[47] Christenson G (1990) The Florida lineament: Gulf Coast Association of Geological Societies Transactions, v. 40, p. 99-115.
[48]https://prd-wret.s3.us-west-2.amazonaws.com/assets/palladium/production/atoms/files/ProbDamageEQ_2018-1.pdf
[49] https://www.usgs.gov/media/images/2018-long-term-national-seismic-hazard-map
[50] Berndt MP, Oaksford ET, and Mahon GL (1998) Groundwater. In: Fernald EA Purdum ED (eds) Water resources atlas of Florida. Tallahassee, Fla State Univ.
[51] Marella RL (2009) Water withdrawals, use, and trends in Florida, 2005.US Geol Surv Sci Inves Rept 2009-5125.
[52] Southeastern Geological Society (1986) Hydrogeological units of Florida. Fla Geol Surv Sp Pub 28.
[53] Missimer TM (1992) Stratigraphic relationships of sediment facies within the Tamiami Formation of southwestern Florida: Proposed intraformational correlations; in Scott TM and Allmon WD, (eds.), The Plio-Pleistocene stratigraphy and paleontology of southern Florida; Florida Geological Survey Spec Pub 36.

beds of the intermediate aquifer system/confining unit (Southeastern Geological Society 1986). Based on the literature, the aquifer system is relatively fresh at the project site.

2.2 Intermediate Aquifer System/Confining Unit

Underlying the surficial aquifer system is the intermediate aquifer system/confining unit, which is comprised of Miocene and late Oligocene sediments of the Hawthorn Group. The aquifer system is leaky to confined in some areas and composed of permeable and impermeable sediments deposited during the Neogene (Upchurch et al. 2019). The siliciclastics flooding southwards onto the Florida Platform during the Miocene and Pliocene contained an abundance of clay and silt. Deposition of the clayey sediments on the Paleogene carbonates created a relatively impermeable sequence of confining beds (Miller 1986,1997; Upchurch et al. 2019). The system ranges in thickness from 130 to 980 feet in south Florida (Reese 2000). The major aquifers of this system include the Sandstone Aquifer (upwards of 100 feet in thickness) and the Mid-Hawthorn Aquifer (up to 130 feet in thickness) and are separated by confining units ranging in thickness from 10 to 250 feet. Permeable carbonate and siliciclastic sediments are, in some areas, interbedded with the impermeable units creating regionally limited, water-producing zones (Miller 1986). The aquifers in the system tend to become more brackish with depth.

2.3 Floridan Aquifer System

The Floridan aquifer system consists of a thick interval of carbonate deposits that underlie intermixed carbonate and siliciclastic sediments of the Miocene-Oligocene Hawthorn Group and consists of five transmissive carbonate formations in southwest Florida. Increasing in depth, formations comprising the upper Floridan aquifer include the base of the Miocene Hawthorn Group (Lower Hawthorn aquifer), the Oligocene Suwannee Limestone, the Upper Eocene Ocala Limestone, and the Middle Eocene Avon Park Formation at the base. Regional unconformities are present at the top of the Upper Eocene Ocala Limestone and/or Avon Park Formation and Oligocene Suwannee Limestone (Miller 1986). Dissolution of the carbonate material occurs at these unconformities in southern Florida, which increases the secondary porosity and, in turn, the transmissivity (Reese 2000). The Middle Eocene Avon Park Formation acts as a confining unit within the aquifer system; however, in some areas, highly permeable zones have been identified in the Middle Eocene Avon Park Formation (Reese and Richardson 2008[54]). The formations comprising the lower Floridan aquifer consist of the Middle Eocene Avon Park Formation, the Lower Eocene Oldsmar Formation, and a portion of the Upper Paleocene Cedar Keys Formation. The Eocene formation boundaries are difficult to accurately define without biostratigraphic data (Miller 1986). The top of the Boulder Zone is typically placed at the top of the first high-transmissivity fractured-zone in the Eocene Oldsmar Formation. The base of the lower Floridan aquifer is at the top of the first thick anhydrite bed sequence of the Paleocene Cedar Keys Formation (Miller 1986). The aquifers tend to transition from brackish to saline within the Floridan aquifer system.

2.3.1 The "Boulder Zone"

In southwest Florida, the proposed injection zone is referred to as the "Boulder Zone", which is stratigraphically part of the Eocene Oldsmar Formation and hydrostratigraphically part of the lower Floridan aquifer. The Boulder Zone is a highly transmissive zone that is upwards of 700 feet thick

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[54] Reese RS and Richardson E (2008) Synthesis of the Hydrogeologic Framework of the Floridan Aquifer System and Delineation of a Major Avon Park Permeable Zone in Central and Southern Florida: US Geol Surv Sci Inves Rept 2007-5207.

in some areas of southwest Florida and has been targeted for the underground disposal of various types of liquid wastes since it was first encountered in the early 1940's (Winston 1996[55]).

Over geologic time in southwest Florida, the brittle dolostones comprising the Eocene Oldsmar Formation became fractured under deformation pressures, and due to the interaction with groundwater and possibly via hypogene speleogenesis, the secondary porosity of the Eocene Oldsmar Formation was greatly enhanced (Herbert and Upchurch 2016[56]; Upchurch 2017[57]). The Eocene Oldsmar Formation dolostones are described as being vuggy to cavernous within the Boulder Zone. It is generally accepted that the fractured dolostone secondary porosity is further enhanced during drilling as the result of borehole collapse and/or collapse of cavities as they are penetrated (Puri and Winston 1974[58]; Hickey and Vecchioli 1986[59]; Duerr 1995[60]; Winston 1996). The name "Boulder Zone" was informally given to the interval by oil-well drillers because drilling through the fractured blocks of dolomite was like drilling through alluvial boulders, and in instances when retrieved, the dolostone appeared well-rounded due to the abrasive action of the drill bit. Actual open cavities, as indicated by bit drops during drilling, are not common; however, Winston (1996) documented examples of actual cavities encountered during oil well drilling in southwest Florida.

Measured transmissivities at wells within the Boulder Zone have been reported to be as high as $2.5x10^7$ square feet per day (ft^2/day; Singh et al. 1983[61]). The Boulder Zone and other highly transmissive intervals in the Floridan Aquifer system, such as the Avon Park high transmissivity zone in the Tampa region, can be identified by greatly enlarged borehole size on caliper logs, exceedingly long sonic transit times, relatively low resistivity, and changes in temperature and flow meter log responses (Haberfeld 1991[62]). The zone can take immense volumes of fluid injection under gravitational flow with little to no pressures necessary The Boulder Zone contains water that is chemically similar to seawater (i.e., high total dissolved solids [TDS] and chlorides) and tends to be sulfur-rich with abundant sulfate and hydrogen sulfide (Haberfield 1991).

3.0 KARST GEOLOGY

Karst is a term that describes landforms that have been created or modified by dissolution of soluble rock. Most of the karst landforms in Florida are developed in limestone; dolostone is less important as a host for karst because it is slightly less soluble than limestone. Karst terranes are characterized by many related landforms, including sinkholes, sinking streams and springs, caves

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[55] Winston GO (1996) The Boulder Zone Dolomites of Florida, Volume 2: Paleogene Zones of the Southwestern Peninsula: Miami Geological Society.
[56] Herbert T and Upchurch SB (2016) The Potential Role of Hypogene Speleogenesis in the lower Floridan aquifer and Sunniland oil trend, south Florida, U.S.A. In: Chavez T. and Reehling P. (eds). Proceedings of Deep Karst 2016: Origins, Resources, and Management of Hypogene Karst, Carlsbad, New Mexico, April 11-14, 2016, Nat Cave and Karst Res Inst, Symp 6.
[57] Upchurch SB (2017) Hypogene Speleogenesis on the Florida Platform. In Hypogene Karst Regions and Caves of the World: Springer.
[58] Puri HS and Winston GO (1974) Geologic Framework of the High Transmissivity Zones in South Florida. Florida Geological Survey Special Publication No. 20.
[59] Hickey JJ and Vecchioli J (1986) Subsurface Injection of Liquid Waste with Emphasis on Injection Practices in Florida: U.S. Geological Survey Water-Supply Paper 2281.
[60] Duerr AD (1995) Types of Secondary Porosity of Carbonate Rocks in Injection and Test Wells in Southern Peninsular Florida: U.S. Geological Survey Water-Resources Investigations Report 94-4013.
[61] Singh WP, Eichler GE, Sproul CR, and Garcia-Bengochea JI (1983) Pump Testing Boulder Zone Aquifer, South Florida: Journal Hydraulic Engineering, v. 9, p. 1152-1160.
[62] Haberfeld JL (1991) Hydrogeology of Effluent Disposal Zones, Floridan Aquifer, South Florida. Ground Water, v.29, p. 186-190.

and upper limestone surfaces that are irregular with pinnacles due to differential dissolution of rock.

The Cenozoic (65 million years ago to the present) sediments that form the Florida Platform are predominantly carbonate rocks covered by variable thicknesses of sand and clay. These carbonate sediments are at or near the land surface in much of central and northern peninsular Florida and the central to eastern Florida panhandle. The carbonate sediments have been subjected to dissolution numerous times during the Cenozoic geologic history of the Platform.

Rain is naturally slightly acidic. As the rainwater percolates into the ground, it slowly reacts with the near-surface carbonate rocks, causing localized dissolution of the sediments. The dissolution of the carbonate rocks is a very slow process that requires thousands to millions of years. The most obvious artifacts of this karst process are the many sinkholes that dot the land surface in many areas of Florida.

3.1 Karst of Big Cypress Province

Limestone is covered by a thin veneer of sand-rich sediments and in some areas is exposed at land surface in Collier County. The nature of the material overlying the limestone, thickness of the cover, and distribution of strength with depth within the cover sediments are critical to determining degree of karstification of the carbonate material. As the water migrates from the surficial aquifer system through the intermediate aquifer system/confining unit and into the Floridan Aquifer System in much of Collier County, it may chemically react with carbonate sediments. This reaction dissolves a portion of the carbonate sediments, which can slowly create karst features. However, there is a limit to how much material can be dissolved and once this limit is reached (chemical equilibrium), the water no longer dissolves the rock and does not create additional karst features. Water may equilibrate with carbonate sediments in the surficial aquifer system. Typically, recharge water equilibrates within the calcareous clay, limestone or dolostone within the intermediate aquifer system/confining unit or in the Floridan Aquifer System.

Near-surface carbonate-rich sediments and rock underlie a relatively thin veneer of sand-rich sediment cover. Microkarst and karren features found on the caprock and limestone surfaces. The caprock is broken throughout the Province and cover-subsidence sinkholes and fractures are commonly filled with sand and peat. In some perennial marshlands, calcitic mud (also referred to as “marl”) has developed from organisms living on the emergent vegetation. This calcitic mud often overlies, and sometimes covers, the microkarstic limestone.

Cover-subsidence sinkholes (sag ponds) are present in much of the Big Cypress Province, especially toward the northern part of the province where Tertiary/Quaternary shelly sediments are at or near the land surface. Dissolution of near-surface, shell and carbonate in these sediments slowly causes these subsidence landforms over geologic time. Cypress domes, hardwood hammocks, and cypress strands are other landforms that are related to surficial dissolution of carbonate sediments. The Big Cypress Province also includes one, known example of a collapse sinkhole, Deep Lake.

Recent studies in southwest Florida have sparked new interest from karst scientists, specifically the injection zone commonly referred to as the “Boulder Zone”, which is stratigraphically part of the Eocene Oldsmar Formation and hydrostratigraphically part of the lower Floridan aquifer. The Boulder Zone is a highly transmissive zone that is upwards of 700 feet thick in some areas of southwest Florida and has been targeted for the underground disposal of various types of liquid wastes since it was first encountered in the early 1940's (Winston, 1996[63]).

Over geologic time in southwest Florida, the brittle dolostones comprising the Eocene Oldsmar Formation became fractured under deformation pressures, and due to the interaction with groundwater and possibly via hypogene speleogenesis, the secondary porosity of the Eocene Oldsmar Formation was greatly enhanced (Herbert and Upchurch 2016; Upchurch, 2017). Paleocene/Eocene and Cretaceous carbonate rocks in deeper horizons are bounded by gypsum/anhydrite and contain strata with widespread breccia zones, unusual porosity development, and high transmissivities. These strata appear to contain hypogene porosity created either along a deep or ancient saline water/freshwater transition zone or by interaction with sulfate-rich waters with abundant hydrogen sulfide (H_2SO_4) development (Upchurch 2017). There is evidence that collapse zones from these deeper strata have migrated upward to the modern land surface. Herbert and Upchurch suggest hypogene karst conduiting should be considered when conceptualizing flow systems and fate and transport of fluids for wastewater disposal in the Boulder Zone of the lower Floridan aquifer (2016). This echoes Klimchouk's criteria for hypogene speleogenesis (2007[64], 2009[65]).

4.0 SITE SPECIFIC GEOLOGY/HYDROGEOLOGY

The geologic units to be encountered during the construction of the proposed saltwater disposal well range in age from Lower Eocene to Holocene (approximately 55.8 million years ago [Ma] to the present). These include, from oldest to youngest, Lower Eocene Oldsmar Formation, the Middle Eocene Avon Park Formation; the Upper Eocene Ocala Limestone; the Oligocene Suwannee Limestone, the Miocene Hawthorn Group, which includes the Arcadia and Peace River Formations; the Miocene Tamiami Formation; and undifferentiated Plio-Pleistocene to Holocene sediments. A generalized hydrostratigraphic column for the project site is presented ***Figure 11***.

4.1 Eocene Oldsmar Formation

The Eocene Oldsmar Formation is a sequence of white to gray, micritic limestone with interbedded tan to light-brown dolomite (Miller 1986; Upchurch 2017). According to Winston (1993), the top of the formation is not identifiable or distinguishable based on lithologic or palaeontologic norms in southern Florida (Winston 1993), but in some areas has an identifiable glauconite marker horizon (Reese and Richardson 2008). The "Boulder Zone" forms part of the Oldsmar Formation, and characteristically contains massively bedded to cavernous or fractured dolostone of relatively high transmissivities and is the target zone for the saltwater disposal well.

Water quality in the Boulder Zone is similar to seawater. Documentation within the regional literature indicates that the proposed injection zone contains water compositionally similar to seawater throughout South Florida. Reported chloride concentrations are in the range of 19,000 to 22,700 milligrams per liter (mg/L) and total dissolved solids (TDS) are in the range of 35,300 to

[63] Winston GO (1996) The Boulder Zone Dolomites of Florida, Volume 2: Paleogene Zones of the Southwestern Peninsula: Miami Geological Society.
[64] Klimchouk AB (2007) Hypogene speleogenesis: hydrogeological and morphogenetic perspectives. National Cave and Karst Research Institute, Carlsbad (NM).
[65] Klimchouk AB (2009) Principal characteristics of hypogene speleogenesis. In: Stafford KW, Land L, Veni G (eds) NCKRI Symposium 1 Advances in Hypogene Karst Studies, p 1–11.

38,800 mg/L, while the modern Gulfstream seawater has chloride and TDS concentrations of approximately 19,300 and 35,800 mg/L, respectively (Meyer 1989[66]).

4.2 Eocene Avon Park Formation

The upper surface of the Eocene Avon Park Formation is identified by a zone of thinly bedded, light brown, finely crystalline to fossiliferous dolomite or dolomitic limestone. The formation is predominantly fine grained, micritic to fossiliferous limestone; however, dolomitic limestone, dense dolomite, and gypsum can also be present and abundant in some areas. Foraminifera characteristic of the Avon Park Formation are *Dictyconus cookei* and *Dictyconus americanus*. At the project location, the formation is part of the Middle Confining Unit, which is comprised of two confining units and one permeable zone (Reese and Richardson 2008). The base of the underground source of drinking water is found within the formation.

4.3 Eocene Ocala Limestone

The Eocene Ocala Limestone consists of nearly pure fossiliferous limestones and occasional dolostones. It can be subdivided into lower and upper facies based on the lithology. The lower member is a white to cream-colored, fine to medium grained, poorly to moderately indurated, very fossiliferous limestone (grainstone and packstone). This may not be present throughout the aerial extent of the Ocala Limestone and may be partially to completely dolomitized in some regions (Miller 1986). The upper facies are a white, poorly to well indurated, poorly sorted, very fossiliferous limestone (grainstone, packstone and wackestone).

Silicified limestone (chert) is common in the upper facies. The chert itself formed long after the carbonates were deposited, as the result of the weathering of the overlying clay-rich Miocene sediments that covered the platform (Scott 1988). Its upper surface has been highly weathered over millions of years and exhibits numerous karst features (e.g., dissolution-enlarged fractures, cavities and channels, and pinnacled limestone). The surface of the Ocala Limestone often has significant relief due to the long history of erosion and dissolution. Epikarst is often well developed because of the long-term weathering of the limestone.

Fossils present in the Ocala Limestone include abundant large and smaller foraminifers, echinoids, bryozoans and mollusks. The large foraminifera *Operculinoides sp.*, *Camerina sp.*, and *Lepidocyclina sp*. is abundant and quite distinctive in the upper facies (Peacock 1983[67]) and extremely limited in the lower facies. Gamma-ray log activity is characteristically low for the unit; however, the upper and lower boundaries of the Ocala Limestone usually are marked by an increase in gamma-ray activity (Reese 2000).

The Ocala Limestone is part of the upper Floridan aquifer and is relatively brackish at the project site location.

4.4 Oligocene Suwanee Limestone

The Oligocene Suwannee Limestone is a white to cream, poorly to well indurated, fossiliferous, vuggy to moldic limestone (grainstone and packstone). The dolomitized parts of the Suwannee Limestone are gray, tan, light brown to moderate brown, moderately to well indurated, finely to coarsely crystalline, dolostone with limited occurrences of fossiliferous (molds and casts) beds.

[66] Meyer FW (1989) Hydrogeology, Ground-water Movement, and Subsurface Storage in the Floridan Aquifer System in Southern Florida: US Geol Surv Sci Prof Pap1403-G.
[67]Peacock R (1983) The post Eocene stratigraphy of southern Collier County, Florida: South Florida Water Management District Technical Publication 83-5,42 p.

Silicified limestone (chert) is common in Suwannee Limestone. Fossils present in the Suwannee Limestone include mollusks, foraminifers, corals, and echinoids.

Limestone in the lower part of the unit is similar to the upper part, but typically contains finer grained, phosphatic, clastic material and interbeds of micrite and clay. Because of these interbeds, gamma ray activity in the Suwannee Limestone often increases with depth below the upper part, which has low activity as found in the Ocala Limestone.

The upper surface of the Suwannee Limestone is often well defined on gamma-ray logs, because of the much higher levels of natural radioactivity associated with the overlying Hawthorn Group sediments. The surface has been highly weathered over millions of years and exhibits numerous karst features. Like the Ocala Limestone, its surface may display significant relief. Epikarst is often well developed because of the long-term weathering of the limestone.

The Suwanee Limestone is part of the upper Floridan aquifer and is relatively brackish at the project site location.

4.5 Miocene and late Oligocene Hawthorn Group

Due to its source materials and depositional environment, the Miocene and late Oligocene Hawthorn Group is a heterogeneous unit that generally consists of interbedded siliclastics and carbonate sediment and rock. The lithology of the unit is highly variable, and lateral and vertical facies (sediment-type) changes can be abrupt and spatially frequent. The distinguishing characteristics of the Hawthorn Group are its high and variable siliclastic and phosphatic content. The sediments are typically green, olive-gray, or light gray. Due to the clay and phosphate content, which is mined in west-central Florida, it has a strong gamma-ray log response with peaks of 100 to 200 API units (American Petroleum Institute standard units) or more.

4.5.1 Arcadia Formation of the Miocene Hawthorn Group

Arcadia Formation of the Miocene Hawthorn Group is the basal unit of the Hawthorn Group. The unit is comprised of sandy, micritic limestone, marlstone, shell beds, dolomite, phosphatic sand and carbonate, sand, silt, and clay. The top of the unit is defined by a sequence of sediments often marked by two high gamma-ray activity peaks. At its base, the Arcadia Formation is part of the Lower Hawthorn aquifer, which is part of the Floridan aquifer system. At the project site location, the aquifer is expected to have a chloride concentration of around 630 milligrams per Liter (mg/L), which is considered slightly brackish, and is the target aquifer for the project industrial supply well.

4.5.2 Peace River Formation of the Miocene Hawthorn Group

The Peace River Formation crops out or is beneath a thin overburden on the southern part of the Ocala Platform extending into the Okeechobee Basin. These sediments were mapped from Hillsborough County southward to Charlotte County. It is composed of interbedded light gray to olive gray, poorly consolidated, clayey, variably dolomitic, very fine to medium grained and phosphatic sands, yellowish gray to olive gray, poorly to moderately consolidated, sandy, silty, phosphatic and dolomitic clays and light gray to yellowish gray, poorly to well indurated, variably sandy and clayey, and phosphatic dolostones and dolosilts. The unit is mined for its phosphate pebble in west-central Florida. Along with vertebrate fossils, fossil mollusks are present in the formation as reworked casts, molds, along with limited original shell material and corals. It is part of the intermediate confining unit/aquifer system (Sandstone Aquifer).

4.6 Pliocene Tamiami Formation

The Pliocene Tamiami Formation is a poorly defined unit containing a wide range of mixed carbonate-siliciclastic lithologies and associated faunas (Missimer 1992). It occurs near the land surface in at the project site. There are many named and unnamed members are recognized within the Tamiami Formation including: the Buckingham Limestone Member; an unnamed tan clay and sand; an oyster (*Hyotissa*) facies, a sand facies, the Ochopee Limestone Member, the Bonita Springs Marl Member; an unnamed limestone facies; the Golden Gate Reef Member; and the Pinecrest Sand Member (Missimer 1992). The individual members of the Tamiami Formation are not separately identified here.

The formation is comprised of unconsolidated to consolidated, fine to coarse grained, fossiliferous sand; light gray to green, poorly consolidated, fossiliferous sandy clay to clayey sand; white to light gray, moderately to well indurated, sandy, fossiliferous limestone. Phosphate is present in virtually all lithologies. Fossils present in the formation occur as molds, casts and original material and include barnacles, mollusks, corals, echinoids, foraminifers and calcareous nannoplankton. The Tamiami Formation has highly permeable to impermeable lithologies that form a complex aquifer. Locally, it is part of the surficial aquifer system, specifically the Lower Tamiami aquifer. Published data indicate that the aquifer has a chloride concentration around 245 mg/L, which would classify it as fresh.

4.7 Plio-Pleistocene to Holocene Sediments

Plio-Pleistocene to Holocene sediments overly the Pliocene Tamiami Formation. These sediments are primarily quartz sand, silt, clay, shell, limestone, and sandy shelly limestone. A cemented paleosol that is often termed caprock occurs in project area. Caprock is a dense limestone or calcite-cemented, shelly, quartz sandstone depending upon the geologic formations and sediments found at the land surface (Upchurch et al. 2019). This unit hosts the water table aquifer and contains fresh water.

5.0 TARGETED PROJECT INJECTION ZONE

The applicant has contracted Water Science Associates to secure water use permits from the South Florida Water Management District for industrial water needs and will commission a licensed Florida water well drilling contractor to obtain the necessary well construction permit(s) in Collier County to drill the needed water supply wells and the Class II Injection well. The saltwater disposal well is targeted for injection into the Eocene Oldsmar Formation, specifically the Boulder Zone.

5.1 Tamiami Prospect Saltwater Disposal Well Targeted Injection Zone

An underground source of drinking water is defined in Title 40 CFR §144.3 as:

> *an aquifer or its portion: (a)(1) Which supplies any public water system; or (2) Which contains a sufficient quantity of ground water to supply a public water system; and (i) Currently supplies drinking water for human consumption; or (ii) Contains fewer than 10,000 mg/l total dissolved solids; and (b) Which is not an exempted aquifer.*

Review of well construction schematics from the Racoon Point SWD System #1 Well #1 (FDEP No. 1121), which is located within two miles from the Tamiami Prospect project site, identified the base of the underground source of drinking water at approximately 2,160 feet below land surface (Florida Department of Environmental Protection 2020). At this depth, the base of the underground source of drinking water is within Middle Confining Unit No. 2 of the Eocene Avon

Park Formation. Review of Class II injection well permit application for the Oleum Corporation 35-5 SWDW well by Lampl/Herbert (2012), which is located approximately 1.25 miles from the Tamiami Prospect project site, indicates the Eocene Oldsmar Formation should be encountered at approximately 2,360 feet below land surface and extends to greater than 3,000 feet below land surface.

Based on the data collected and the literature reviewed, the proposed Tamiami Prospect saltwater disposal well will be designed such that intermediate and final well casing are extended past the base of the underground source of drinking water and into the top of the Boulder Zone. This will provide additional environmental protection of the overlying aquifers and other environmental receptors. With Middle Confining Unit No. 2 confining the Boulder Zone and the proposed injection depth approximately 300 feet below the base of the US underground source of drinking water DW, the proposed Tamiami Prospect saltwater disposal well injection zone will consist of tan open hole interval from approximately 2,450 to 2,950 feet below land surface.

6.0 SUPPLY STORAGE

Rental storage tanks will be on site for temporary, short term storage of excess drilling fluids and produced water.

7.0 FORMATION TESTING PROGRAM

Title 40 CFR §146.22: Formation Testing Program

Provide a formation testing program to obtain data on:

- *fluid pressure,*
- *estimated fracture pressure, and*
- *physical and chemical characteristics of the injection zone.*

During well construction, formation logging will be completed and will consist of well logging, borehole geophysics (caliper, gamma log, spontaneous potential logs, fluid resistivity logs, temperature logs, and cement bond logs) formation fluid sampling via swabbing, and step rate testing (SRT). This testing program will help identify potential injectivity, original formation pressure, lithologic make up, density, porosity, salinity, total dissolved solid (TDS), and fracture pressure. Further details regarding these tests are provide on **Table 4.**

1.0 WELL SCHEMATIC DIAGRAM

Title 40 CFR §146.24 Well Schematic Diagram

Provide a detailed proposed well schematic diagram that includes:

- *identification of USDWs and confining and injection zones,*
- *casing and cementing details, including demonstrated or calculated top of cement,*
- *tubing and packer (if applicable),*
- *open hole or perforated intervals, and*
- *surface trace (if horizontal or deviated well).*

The well construction details are provided on the schematics depicted on ***Figures 12*** and ***13***. The injection well casing depths were specifically designed to protect environmental receptors, existing legal uses, and the overlying aquifers. The casing materials were specifically selected for their mechanical and structural integrity over the expected lifespan of the injection well, which is forty years. The inner diameter of the 4.5-inch fiberglass reinforced pipe or lined steel pipe for the tubing and packer system is 3.98-inches, while the 8.625-inch outside diameter production casing has an inner diameter of 8.097-inches. Using these dimensions, the tubing and packer system daily volume maximum at 10 feet per second is 0.56 MGD, while the production casing daily volume maximum at 10 feet per second is 2.31 MGD.

2.0 WELL CONSTRUCTION OR CONVERSION PROCEEDURES

Title 40 CFR §144.52; §146.22; §146.24: Well Construction or Conversion Procedures

Provide detailed description of well construction or conversion procedures, that includes:

- *proposed logs and other tests conducted during the drilling and construction of new well(s),*
- *proposed stimulation plan(s), if planned, and*
- *description of alarms and shut-down systems at the well (if applicable).*

For wells that are drilled and to be converted to an injection well, also provide:

- *well completion and cementing records, and*
- *previously run logs/tests.*

In addition to the drilling and completion program generally described below, details are further provided in the following tables: ***Table 5***. Well Construction Plan; ***Table 6***. Well Cementing Plan; and ***Table 7***. Proposed Logs and Tests. A detailed completion procedure and as-built wellbore schematic will be submitted to the United States Environmental Protection Agency after the well is drilled, cased, cemented, and logged.

2.1 Drilling and Completion Program

1. Either drive 20-inch outside diameter, 94 pound per foot, API J-55 steel conductor casing to 250 feet below land surface (or first refusal). If casing cannot be driven, drill a nominal 26-inch borehole to 250 feet below land surface, attach centralizers to the casing at 50-foot intervals (one per joint), and then ASTM Type I/II cement to surface and allow to develop compressive strength.
2. Drill a nominal 18.5-inch borehole from surface to approximately 2,210 feet below land surface. Sample any water influxes that may occur on the way to total depth.

3 Run open borehole logs: gamma ray, spontaneous potential (SP), caliper, borehole compensated sonic/variable density, dual induction; and TDS log based on dual induction and sonic porosity.
4 Run cement float equipment and 13.375-inch outside diameter, 54.5 pound per foot, API J-55 steel casing from surface to 2,210 feet below land surface. Centralizers will be attached to the casing at a minimum 50-foot intervals or one per joint.
5 Cement the well with ASTM Type I/II cement from drill depth to surface. If cement falls down the annulus, stage top jobs until hole stays full. Rig down and wait on cement.
6 Run a gamma ray log, a casing collar locator, and cement bond log and verify competent cement.
7 Install blowout preventer and pressure test casing to 1,000 pounds per square inch (psi) for thirty minutes.
8 Drill out cement shoe and continue drilling to 2,450 feet below land surface with a 12.25-inch bit.
9 If using YBI Packer system, install female receiver to lowermost end of 8.625-inch outside diameter casing.
10 Run 8.625-inch outside diameter, 24 pound per foot, API J-55 steel production casing from surface to depth drilled to 2,450 feet below land surface. Centralizers will be attached to the casing at a minimum 50-foot intervals or one per joint. Pump ASTM Type I/II cement in two stages. Rig down and wait on cement.
11 Run a gamma ray log, a cement bond log, and a casing collar locator.
12 Pressure test casing to 1,500 psi for thirty minutes.
13 Drill out cement shoe and continue drilling to termination depth of 2,850 feet below land surface with a 7.875-inch bit via reverse air methods.
14 Swab well for three (3) well volumes or until the conductivity stabilizes. Collect sample for analysis.
15 If a permanent seal bore packer system is chosen by the Contractor, set profile nipples and blanking plugs. Then circulate packer fluid through tubing, sting back into the packer system (or close bypass valve), then retrieve blanking plug via slickline. Set packer at 2,440 feet below land surface. This packer fluid mix consisted of 95 barrels of mixed 3 percent potassium chloride (KCl) water, CMS-101 (Oxygen Scavenger), X-Cide 102 (Biocide) and CMS 450 (Corrosion Inhibitor).
16 If YBI Packer system is chosen by the Contractor, attach the male end of system to injection tubing and run the 4.5-inch outside diameter, 12.75 pound per foot threaded and coupled fiberglass-reinforced pipe injection tubing or equivalent internally coated, corrosive resistant plastic-coated or poly-lined steel tubing.
17 Land tubing, nipple up wellhead.
18 Conduct step rate test.
19 Conduct internal mechanical integrity test per United States Environmental Protection Agency guidelines.

Well Alarm Information

There will be multiple operating alarms enabled for the wells. These alarms include the following: High Tank Level, Low Tank Level, High Injection Pressure, Low Tank Level, Low Injection Pressure, High Annulus Pressure and Low Annulus Pressure. These alarms can be set to any value or level required and can be remote set and controlled. For routine operations, the High Tank Level, Low Tank Level and High Injection Pressure alarms are enabled and can automatically shut down injection operations if operating conditions approach values set at points below operating or regulatory limits.

Title 40 CFR §146.23; §146.24: Injection Operation and Monitoring Program

Submit the following information:

- *flow diagram of fluid flow through the facility,*
- *contingency plan(s) to cope with well failure, so as to prevent migration of contaminating fluids into a USDW,*
- *drawing of the surface construction,*
- *locations of all monitoring devices (show on the map(s) referenced in section A.III. above), and*
- *description of sampling and monitoring devices to monitor the nature of the injected fluids, injection pressure, annulus pressure (if applicable), flowrate, and cumulative volume.*

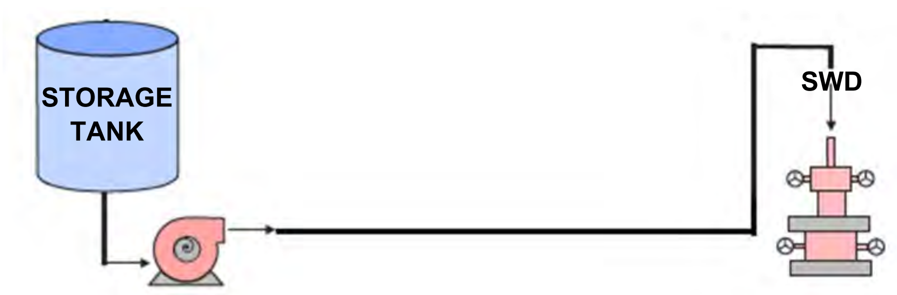
Hydrocarbon storage and enhanced recovery may be monitored on a field or project basis rather than on an individual well basis by manifold monitoring. If a manifold monitoring program is utilized, describe details of the monitoring program and how the program is comparable to individual well monitoring. Also, include on the map in section A.III.B, the distribution manifold applying injection fluid to all wells in the area, including location of all system monitoring locations.

Additionally, submit the following proposed operating data for each well in the individual or area permit:

- *average and maximum daily rate and volume of fluids to be injected,*
- *average and maximum injection pressure,*
- *source(s) of injection fluids (including field and formation names),*
- *proposed annular fluid, and*
- *analysis of the chemical and physical characteristics of the injection fluid. At a minimum, this should include pH, specific gravity, TDS, and conductivity. Consult with the regional EPA office for additional guidance.*

1.0 FLOW DIAGRAM

A generalized facility surface flow diagram schematic is presented below. Note: The is not to scale and is for demonstrative purposes only.



2.0 CONTINGENCY PLAN

Table 8 provides a summary of potential failure events. In the event of mechanical failure, such as tubing, packer, or casing failure, the injection well will be shut down. The well failure will then be diagnosed and remediated, as necessary.

Should the failure be mechanical, the well will be remediated via well workovers. Workover procedures can vary depending on the mechanism of failure as well as the extent of the failure.

Should any workover require alteration to the current well design of injection intervals, a major modification document will be submitted as required.

To prevent casing leaks from occurring above a packer, the annulus between the injection string and casing will be filled with corrosion inhibiting packer fluid. The annular fluid in both wells consists of a mixture of potassium chloride (KCl) water and packer fluid.

To ensure mechanical integrity is being maintained, rate, tubing, and annuli (Bradenhead annulus and tubing-casing annulus) data are monitored and reported.

Additionally, shutdowns could also be triggered by surface facility failure and annual or other testing needs. The above well failures will result in well shut-in until the issues have been successfully determined and addressed.

3.0 SAMPLING DEVICES AND MONITORING PROGRAM

Devices used to monitor and alarm for tank levels, injection pressures, and annulus pressures will be installed and monitored on a routine basis. Except for the tank monitors, the other monitors are located at the wellhead. The injection monitoring system also records injection rates, injection pressures, annular pressure, and volumes.

4.0 INJECTION PROCEDURES

A buried water flowline will transport fluids from the battery tank to the injection well less than 250 feet away. The Applicant plans to install monitoring equipment as required by the United States Environmental Protection Agency as well as telemetry equipment to monitor injection pressure, injection rate and casing pressure via the supervisory control and data acquisition (SCADA) system. Additionally, the well will be checked daily with rates and pressures recorded weekly at a minimum. If any non-compliant situation is found, the well will be immediately shut-in, and the United States Environmental Protection Agency notified. Injection will not resume until corrective action has been taken and the United States Environmental Protection Agency has issued authorization to inject.

5.0 OPERATING DATA INFORMATION

The daily volumetric disposal for the saltwater disposal well will vary depending upon water production rates from producers in the vicinity. Injection rate will be constrained by the maximum allowable injection pressure at surface.

Annular fluid will be composed of fresh water treated with scale and corrosion inhibitors. The annulus will be filled to the surface with treated fluid and the pressure monitored to detect the occurrence of any leaks in the injection tubing or packer. The annular fluid will be circulated into place during the completion.

The injected fluid will consist of produced water operated by the Applicant. No fluid of any type from outside-operated wells will be injected. Representative injectate water quality of similar saltwater injection wells in South Florida are presented in ***Table 9.***

The following is a summary of the proposed operating parameters for the proposed saltwater disposal well:

- Maximum Injection Rates: 0.54 million gallons per day;
- Average/Maximum Injection Pressures: 30 psi / 50 psi; and
- Annulus Pressure Range: 10 to 100 psi.

The following summarizes the calculation to assign a maximum allowable injection pressure (MAIP):

$$MAIP = FP$$

Where:

- Formation Pressure (FP), which is measured at land surface, is calculated using the following equation:

$$FP = (FG - \left(0.433 \times (SG + 0.05)\right)) \times D$$

Where:

- FG: Fracture gradient of the injection zone in pounds per square inch/feet (psi/ft). The Applicant will perform a step rate test to determine the fracture gradient at the saltwater disposal well to calculate the final maximum allowable injection pressure.
- SG: Specific gravity, which is estimated to be greater than 1.0.
- D: True vertical depth in feet from land surface to the top of the open borehole at the base of the final casing.

Actual pressure will depend upon the actual injection interval depth after the injection interval is identified from logs and approved by the United States Environmental Protection Agency.

PLUGGING AND ABANDONMENT PLAN

Title 40 CFR §144.31; §144.51; §146.24: Plugging and Abandonment Plan

Submit a plugging and abandonment (P&A) plan of the well on EPA Form 7520-19 along with a P&A diagram. The plan should include:

- *type, and number of plugs to be used,*
- *placement of each plug including the elevation of top and bottom,*
- *type, grade, and quantity of cement to be used, and*
- *method of placement of the plugs.*

Provide one or more cost estimates from an independent firm in the business of plugging and abandoning wells to conduct the work proposed in the P&A plan for EPA to contract plugging of the well. This is to ensure that EPA has adequate funding to plug the well(s) if the operator is unable to plug the well(s).

1.0 PLUGGING AND ABANDONMENT

The proposed saltwater disposal well will be plugged and abandoned in accordance with the United States Environmental Protection Agency guidelines and requirements when its service life is over. The plugs will cement the entire wellbore from the injection zone to land surface. The following information is provided in ***Exhibit Nos. 6***, ***7***, and ***8***, respectively:

- Completed and signed United States Environmental Protection Agency Form 7520-19;
- Detailed plugging and abandonment plan with associated diagram; and
- Four independent cost estimates from contractors for plugging and abandonment of the proposed saltwater disposal well.

A summary from the four independent estimates from contractors for the cost and materials required to implement the plugging and abandonment procedures. The Applicant will use the highest estimate for financial responsibility demonstration.

- Contractor A: Applied Drilling Engineering, Inc. $215,000.00
- Contractor B: All Webb's Enterprises, Inc. $300,000.00
- Contractor C: A.C. Schultes of Florida, Inc. $319,700.00
- Contractor D: Youngquist Brothers, Inc. $231,380.00

FINANCIAL ASSURANCE

Title 40 CFR §144.52: Financial Assurance

Submit evidence of financial resources, such as a surety bond or financial statement, necessary for a third party to close, plug, or abandon the well in the event an owner or operator is unable to do so.

The Applicant intends to demonstrate UIC financial responsibility by submittal of a UIC Surety Bond for $320,000 to be held by a third-party bondholding company to cover the plugging cost of the Tamiami SWD#1 when the permit is approved (***Exhibit No. 9***).

SECTION G
SITE SECURITY AND MANIFEST REQUIREMENTS

> *Provide a proposed site security plan. This could include fencing around the perimeter of the facility. Consult with the regional EPA office for additional guidance on manifest requirements.*

Fencing and a locking gate will provide isolation for the facility. This is a Class II, non-commercial facility. There has been no need for manifest records or requirements identified by the United States Environmental Protection Agency.

SECTION H
AQUIFER EXEMPTION

<u>Title 40 CFR §144.7; §146.4: Aquifer Exemption</u>

If an aquifer exemption (AE) is requested, submit the information required at Title 40 CFR § 144.7 and to demonstrate that the criteria found at Title 40 CFR § 146.4 are met. Consult with your regional EPA office for additional guidance.

An aquifer exemption is not required at the proposed Tamiami Prospect project site. The Boulder Zone of the Eocene Oldsmar Formation is expected to have salinities greater than 10,000 ppm TDS in the area of the Tamiami Prospect project site.

SECTION I

EXISTING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY PERMITS

Title 40 CFR §144.31: Existing EPA Permits

Submit a listing of all permits or construction approvals received or applied for under any of the following programs:

- *Hazardous Waste Management program under RCRA,*
- *UIC program under SDWA,*
- *NPDES program under CWA,*
- *Prevention of Significant Deterioration (PSD) program under the Clean Air Act,*
- *Nonattainment program under the Clean Air Act,*
- *National Emission Standards for Hazardous Pollutants (NESHAPS) preconstruction approval under the Clean Air Act.*
- *Ocean dumping permits under the Marine Protection Research and Sanctuaries Act,*
- *Dredge and fill permits under section 404 of CWA, and*
- *Other relevant environmental permits, including State permits.*

No other United States Environmental Protection Agency permit has been issued for this project.

DESCRIPTION OF BUSINESS

<u>Title 40 CFR §144.31: Description of Business</u>

Provide a brief description of the nature of the business.

Burnett Oil Co. Inc. is a privately owned oil and gas exploration and production company.

1.0 THE WILD AND SCENIC RIVERS, 16 U.S.C. 1273 ET SEQ.

Florida has approximately 26,000 miles of river. Only two river systems are identified under the act: the Loxahatchee and Wekiva rivers (U.S. Fish and Wildlife Service, 2020[68]). Both river systems are located in Central Florida. Neither of these river systems are in proximity to the project site.

2.0 THE NATIONAL HISTORIC PRESERVATION ACT OF 1996, U.S.C. 470 ET SEQ.

The following information is quoted from the *March 2016 Revised Environmental Assessment for the Nobles Grade 3-D Seismic Survey* (USDOI-NPS 2016[69]):

> *According to the NPS/SEAC and the Florida Master Site File (FMSF) databases, there are more than 400 recorded archeological sites in the Preserve. In addition, currently there is no available database for ethnographic resources such as cultural IRA's in the Preserve, and SEAC anticipates that there are several hundred unrecorded sites in the Preserve, some of which would be included in the survey area. Recorded sites and anticipated cultural resources may include prehistoric habitation areas, burial areas, special use camps, 19th Century military camps, fortifications, trails, and historic Seminole or Miccosukee camps and sacred areas, as well as 20th century hunting and lumber camps. Many of the recorded resources are associated with discrete environmental features within the Preserve's vast expanse of wetlands, sloughs, strands and hammocks. Many habitation sites, especially black dirt middens, are recorded in hardwood hammocks, rising above the surrounding terrain, often near deep sloughs, strands and vast marshlands.*

A Cultural Avoidance Model was prepared by Archeological Consultants Inc. in 2014 for Burnett Oil Co., Inc. and was submitted to National Park Service (USDOI-NPS 2016). According to the model, the proposed operations area has a very low probability of encountering sites or artifacts of cultural/historic significance, due to the fact that the entire operations area is located on soils that are very shallow to caprock and are inundated for approximately six months per year on average. The proposed operations area avoided areas of higher elevation that contain hardwood hammock and similar vegetation, where cultural and/or historic resources are much more likely to occur.

3.0 THE ENDANGERED SPECIES ACT, 16 U.S.C. 1531 ET SEQ.

The presence of endangered species was evaluated, surveyed, and reported by Stantec in April 2020[70] in their report to the National Parks Service. The following listed wildlife species were either documented by Stantec referred to as "potentially occurring" at/nearby the project site: American alligator (*Alligator mississippiensis*); eastern indigo snake (*Drymarchon corais couperi*); bald eagle (*Haliaeetus leucocephalus*); Everglade snail kite (*Rostrhamus sociabilis plumbeus*); wood stork (*Mycteria americana*); red-cockaded woodpecker (*Picoides borealis*); northern caracara (*Caracara cheriway*); Florida sandhill crane (*Grus canadensis pratensis*); roseate spoonbill (*Platalea ajaja*); little blue heron (*Egretta caerulea*); tricolored heron (*Egretta tricolor*);

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[68] https://www.rivers.gov/florida.php
[69] USDOI-NPS National Park Service (2016) Revised Environmental Assessment for A Proposed Oil and Gas Plan of Operation: Nobles Grade 3-D Seismic Survey within Big Cypress National Preserve proposed by Burnett Oil Company, Inc.
[70] Stantec (2020) Operations Permit Application for Drilling and Production at the Nobles Grade and Tamiami Prospects, Big Cypress National Preserve.

Big Cypress fox squirrel (*Sciurus niger avicennia*); Florida panther (*Felis concolor coryi*); Florida bonneted bat (*Eumops floridanus*); and Everglades mink (*Neovison vison evergladensis*).

3.0 THE COASTAL ZONE MANAGEMENT ACT, U.S.C 1451 ET SEQ.

The U.S. Congress passed the Coastal Zone Management Act in 1972. Administered by the National Oceanic and Atmospheric Administration (NOAA) provides for the management of the nation's coastal resources, including the Great Lakes. The Florida Coastal Management Program was approved by the National Oceanic and Atmospheric Administration in 1981, with the Florida Department of Environmental Protection serving as the lead agency. A network of nine state agencies and five water management districts together enforces twenty-three separate statutes. The Florida coastal zone is the entire state but is divided into two tiers. Only coastal cities and counties that include or are contiguous to state water bodies are eligible to receive coastal management funds.

While the project site is therefore located within the Florida coastal zone, the injection activities are occurring over 2,000 feet below land surface with notable aquitards confining the injection zone from land surface. There is a low probability that injection well activities will impact the zone and multiple preventative and monitoring measures will be installed to prevent upward migration of injectate.

SECTION L
PROFESSIONAL CERTIFICATION

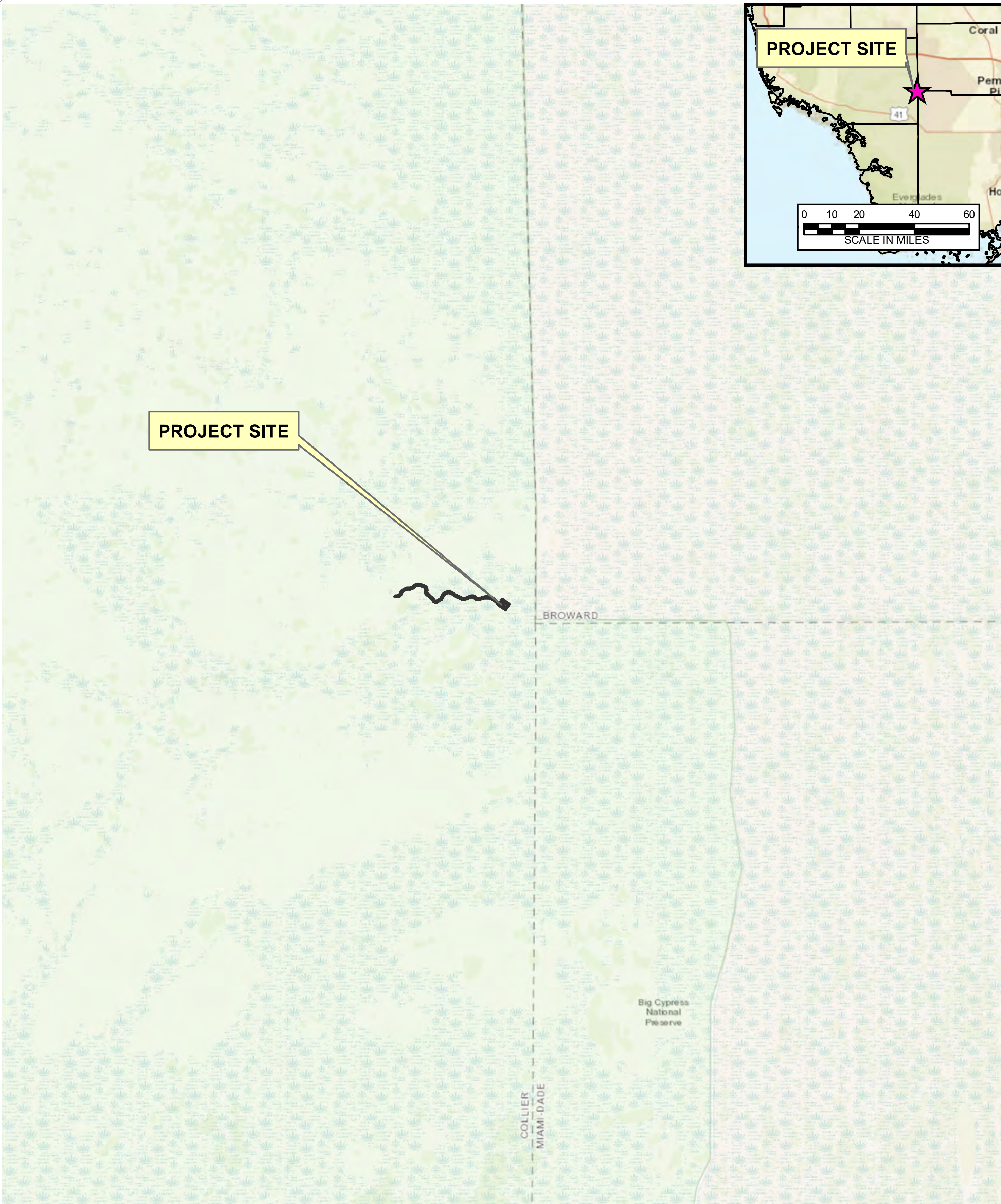
I, Michael C. Alfieri, hereby certify that I am a Professional Geologist licensed in the State of Florida and that the accompanying document was prepared by me or under my supervision and is in general conformance with the Department of Business and Professional Regulation, Division of Professions, Board of Professional Geologists Practice Rules and Statutes (Rules Chapter No. 61G16-1 through 61G16-9/ Statute: Chapter 492). Based on current methodologies and the current state of the professional practice of geology, the geologic information provided is true and correct to the best of my knowledge and belief based on the data collected.

Digitally signed by Michael C. Alfieri, P.G., P.Hg, CGWP
DN: cn=Michael C. Alfieri, P.G., P.Hg, CGWP, o=Water Science Associates, email=michaela@wsaconsult.com, c=US
Date: 2021.04.19 13:19:43 -04'00'

Michael C. Alfieri, P.G., P.Hg., CGWP
Florida Professional Geologist No. 2476

FIGURES

Figures 1 Through 13



Water Science Associates

PROJECT NAME: TAMIAMI PROSPECT

PROJECT NUMBER: 17620-02

DECEMBER 2020

FIGURE 1. REGIONAL LOCATION MAP.

Water Science Associates

PROJECT NAME: TAMIAMI PROSPECT

PROJECT NUMBER: 17620-02

DECEMBER 2020

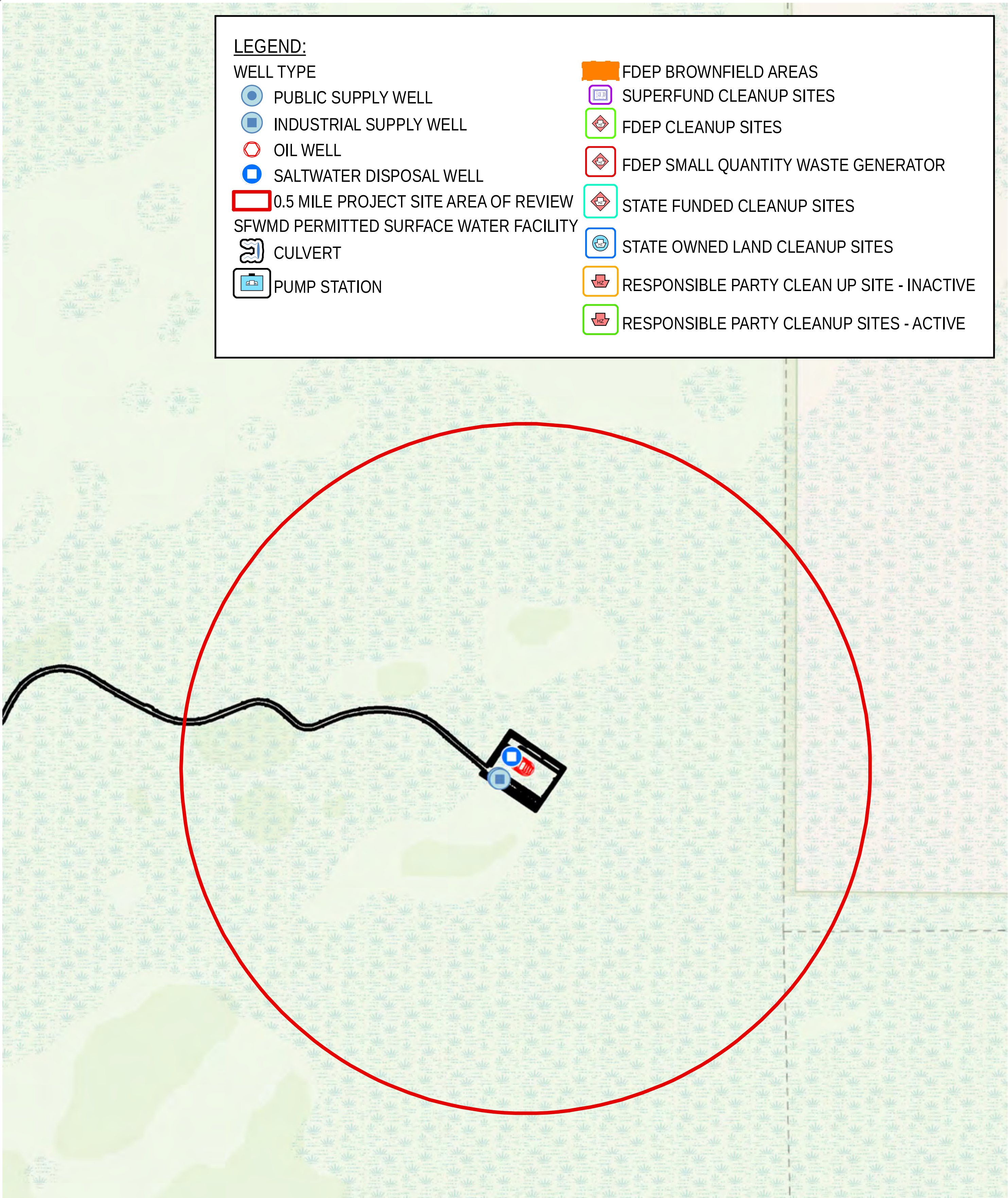
N

0 25 50 100
SCALE IN FEET

FIGURE 2. PERTINENT FEATURES OF PROJECT SITE.

Water Science Associates	PROJECT NAME: TAMIAMI PROSPECT	N 0 250 500 1,000 SCALE IN FEET
	PROJECT NUMBER: 17620-02	DECEMBER 2020

FIGURE 3. AREA OF REVIEW BOUNDARY.



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PROJECT NUMBER: 17620-02

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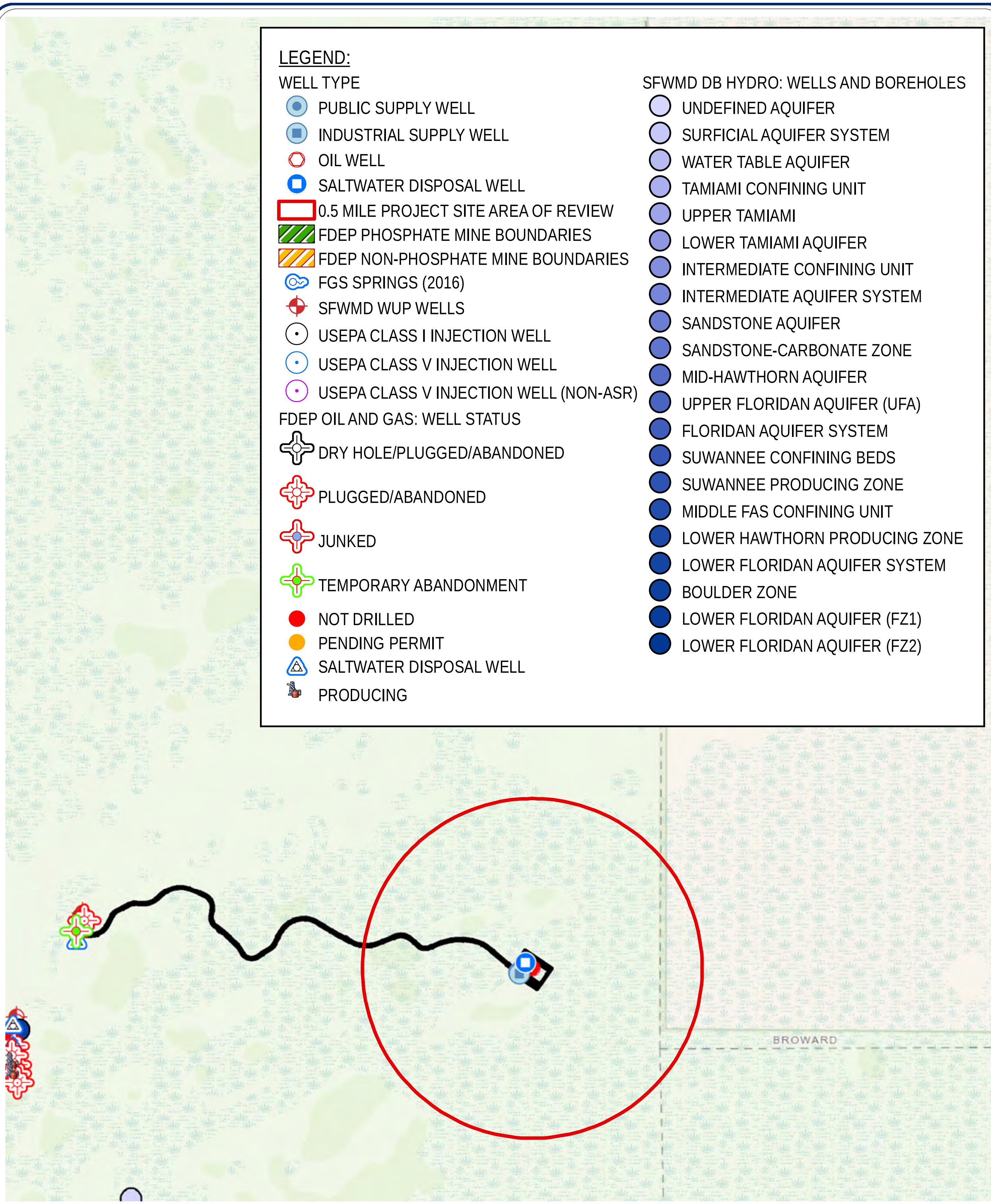
FIGURE 4. ONE HALF MILE REVIEW OF SURFACE WATER STRUCTURES AND HAZARDOUS WASTE TREATMENT AND STORAGE FACILITIES.



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PROJECT NAME: TAMIAMI PROSPECT

PROJECT NUMBER: 17620-02

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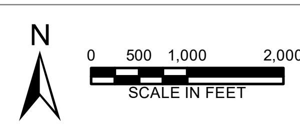
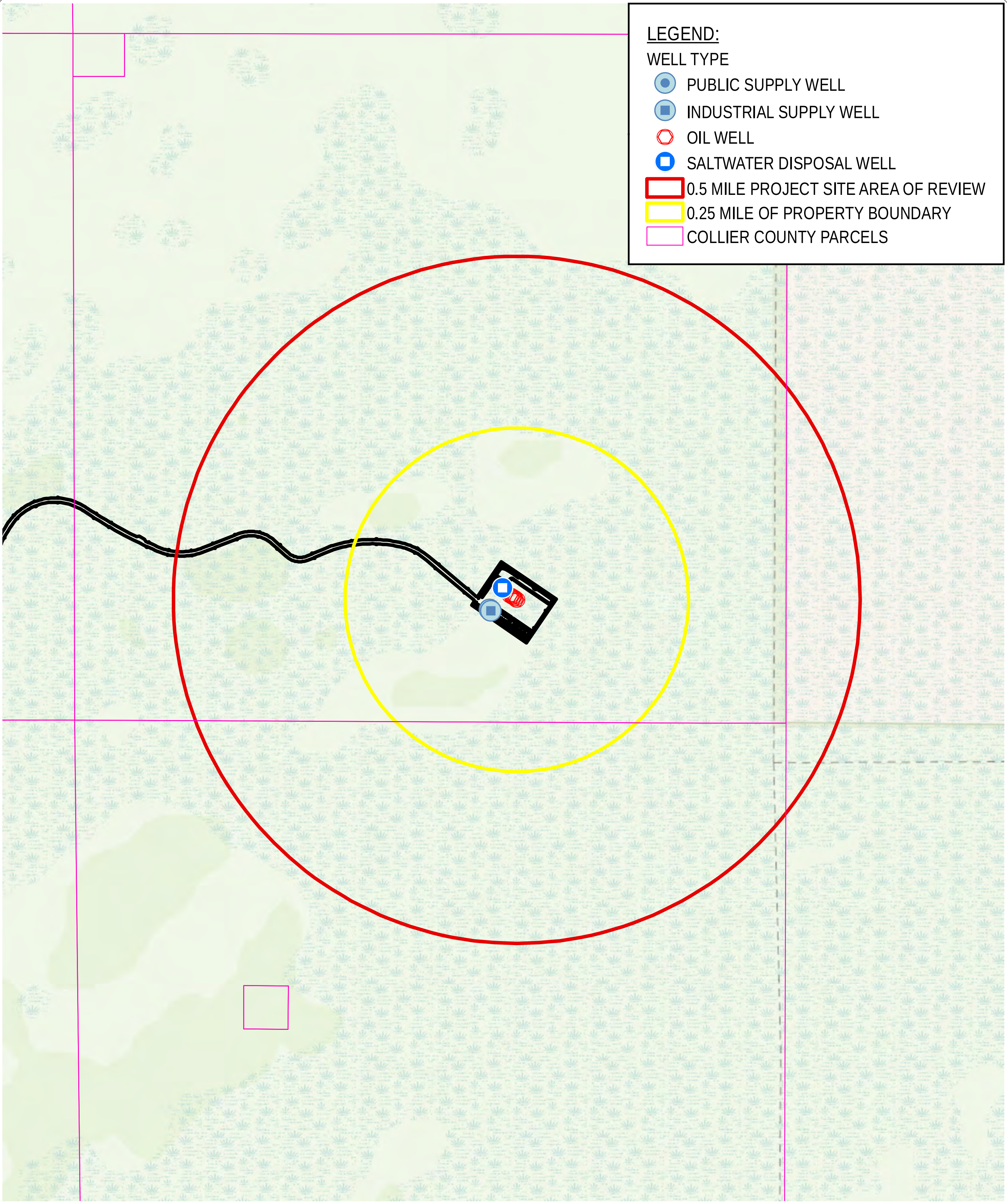


FIGURE 5. ONE HALF MILE REVIEW OF WELLS, SURFACE WATER BODIES, AND PERTINENT SURFACE FEATURES.



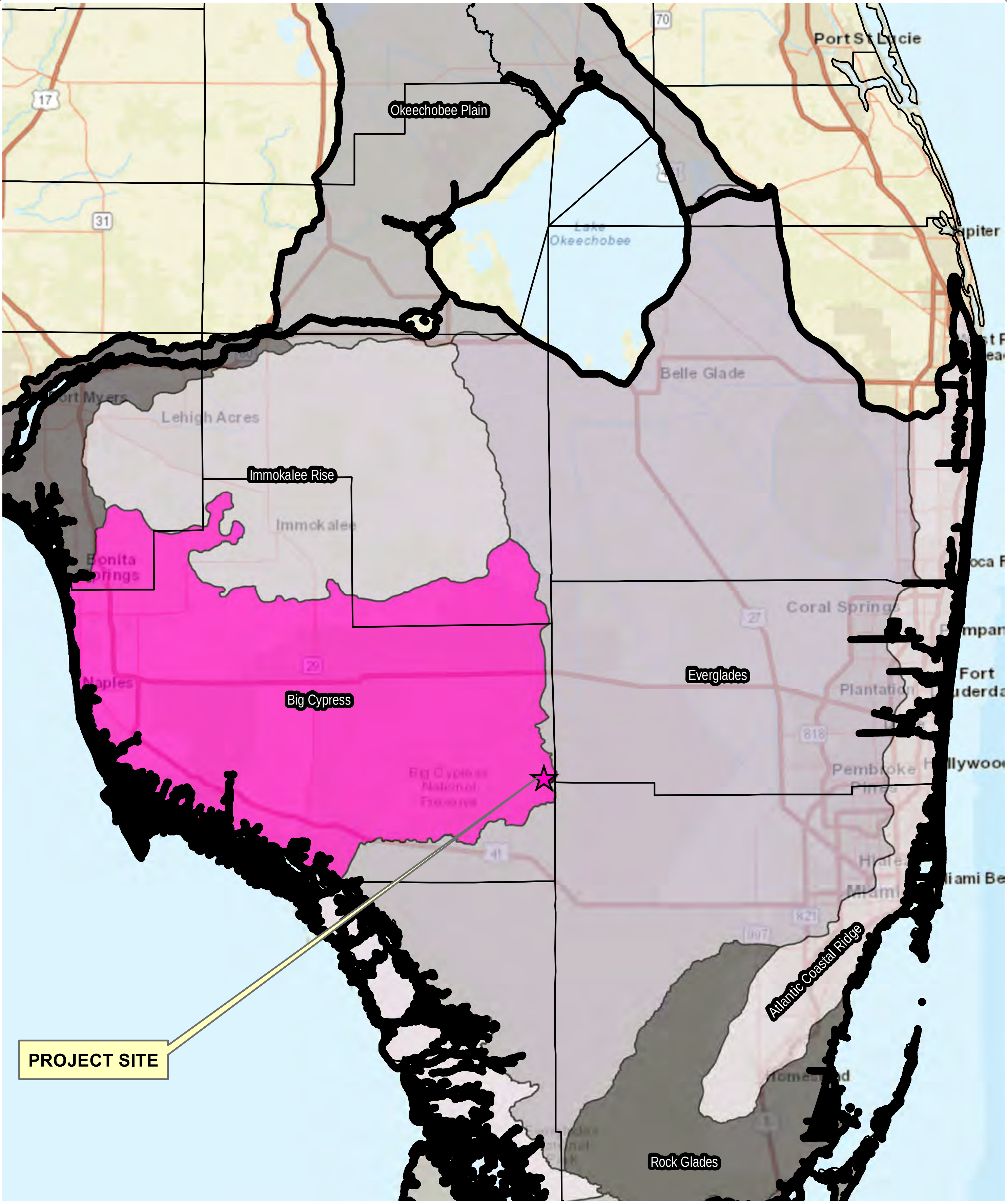
Water Science Associates

PROJECT NAME: TAMIAMI PROSPECT

PROJECT NUMBER: 17620-02

DECEMBER 2020

FIGURE 6. COLLIER COUNTY PARCELS.



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PROJECT NAME: TAMIAMI PROSPECT

PROJECT NUMBER: 17620-02

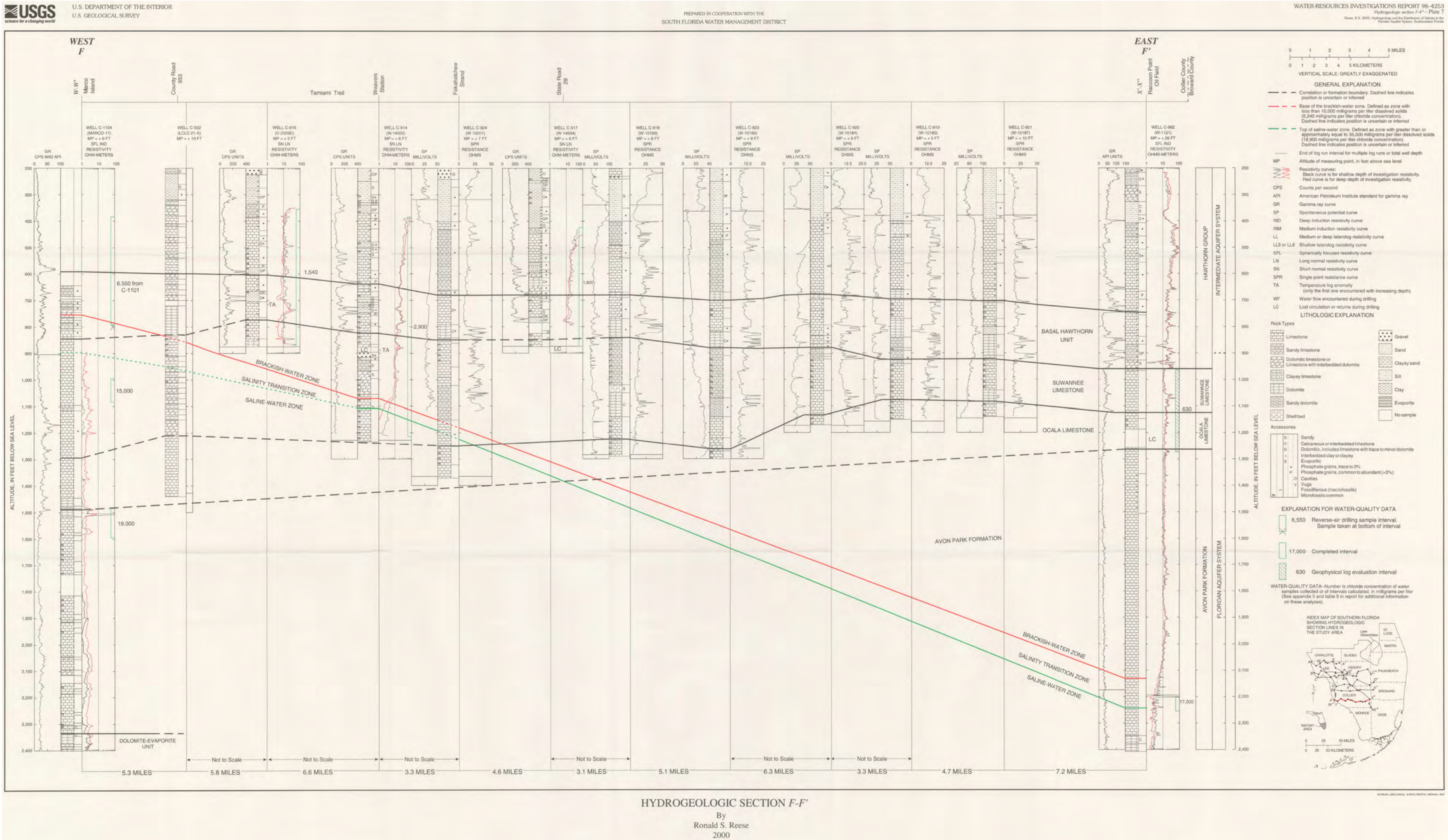
DECEMBER 2020

N

0 5 10 20

SCALE IN MILES

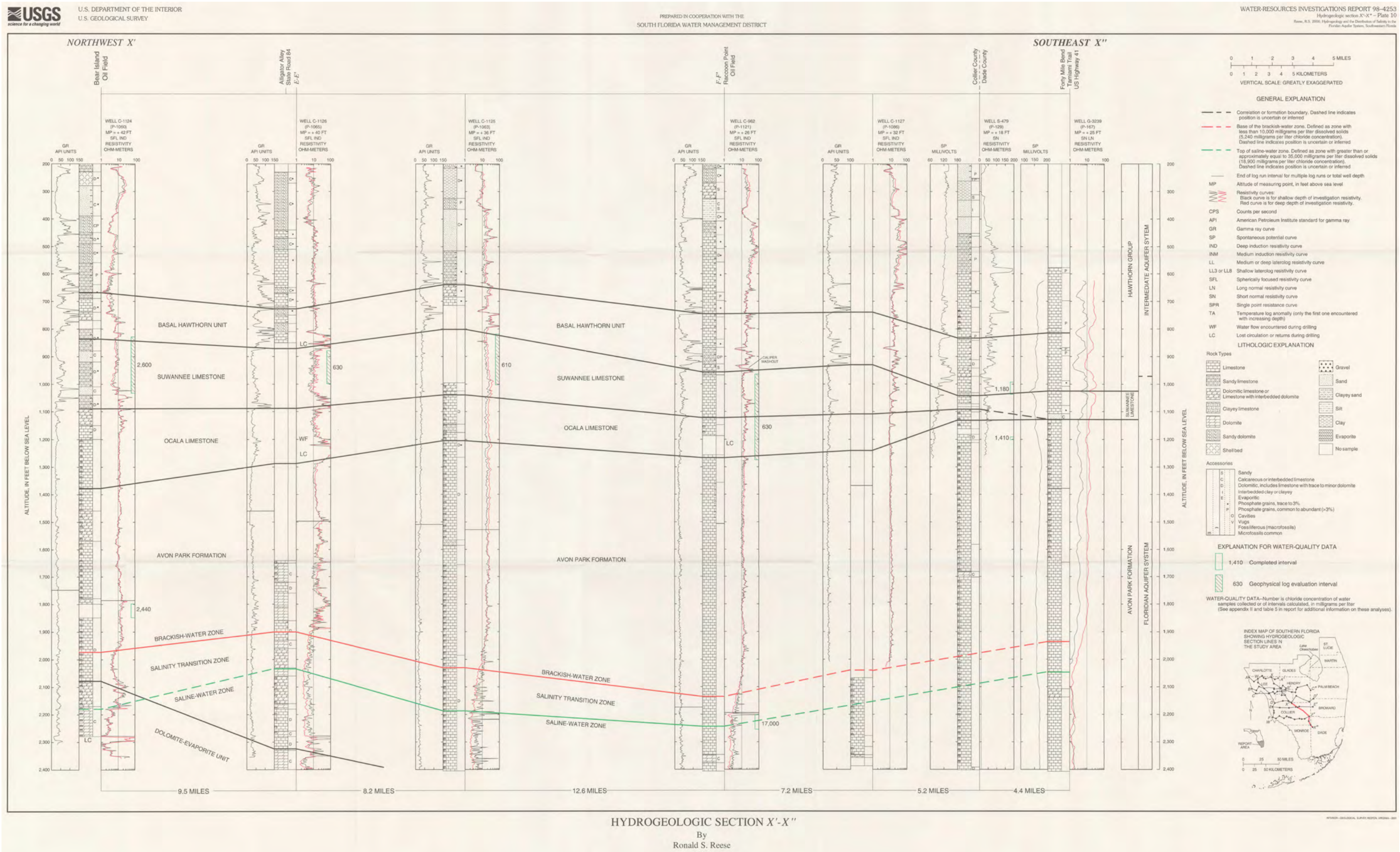
FIGURE 7. REGIONAL GEOMORPHIC DISTRICT AND PROVINCES.



Water Science Associates

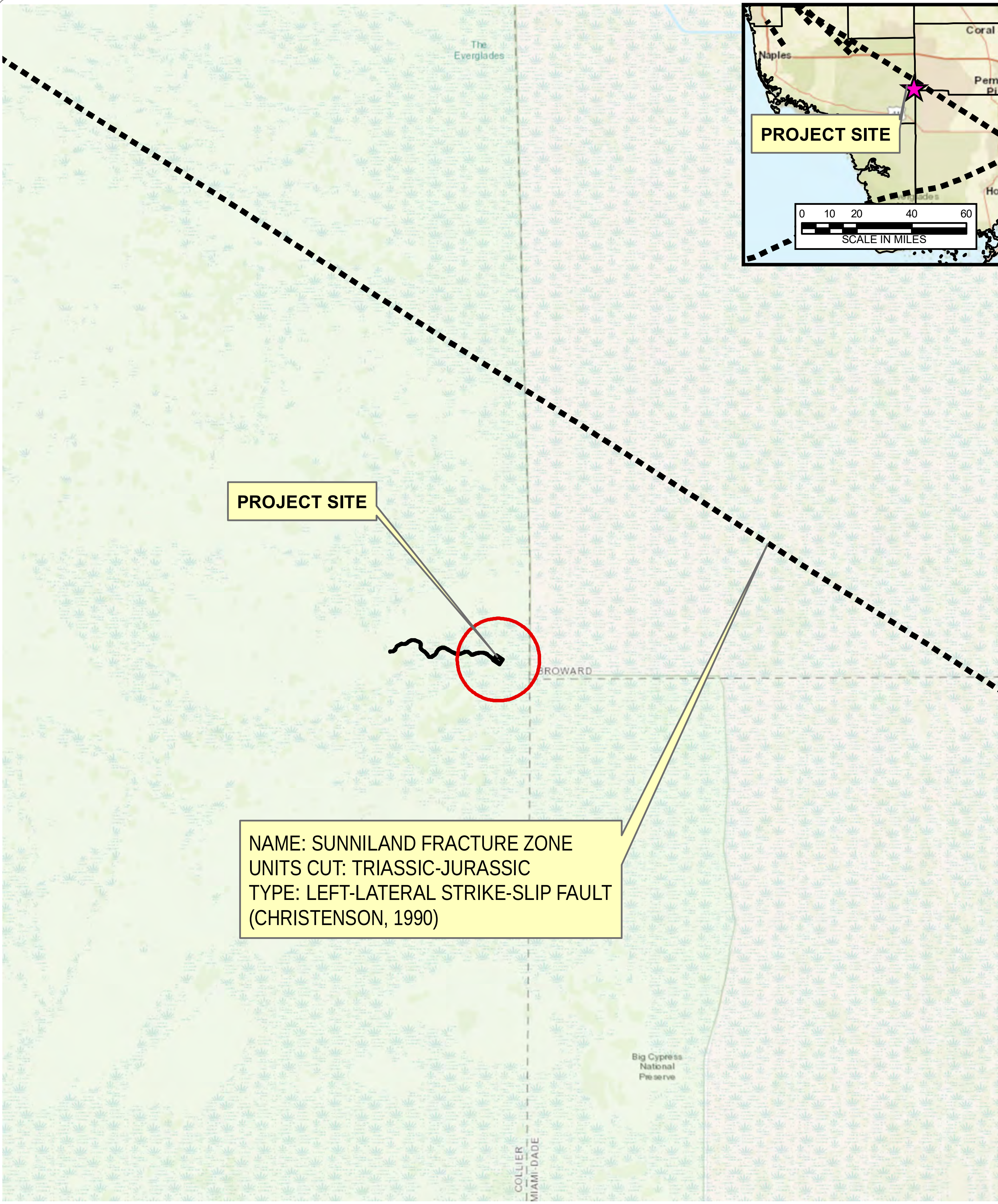
PROJECT NAME: TAMIAMI PROSPECT		N SCALE AS SHOWN
PROJECT NUMBER: 17620-02	DECEMBER 2020	

FIGURE 8. REGIONAL EAST-WEST GEOLOGIC CROSS-SECTIONS (MODIFIED FROM REESE 2000).



Water Science Associates	PROJECT NAME: TAMIAMI PROSPECT	N SCALE AS SHOWN
	PROJECT NUMBER: 17620-02	DECEMBER 2020

FIGURE 9. REGIONAL SOUTHEAST-NORTHWEST GEOLOGIC CROSS-SECTIONS (MODIFIED FROM REESE 2000).



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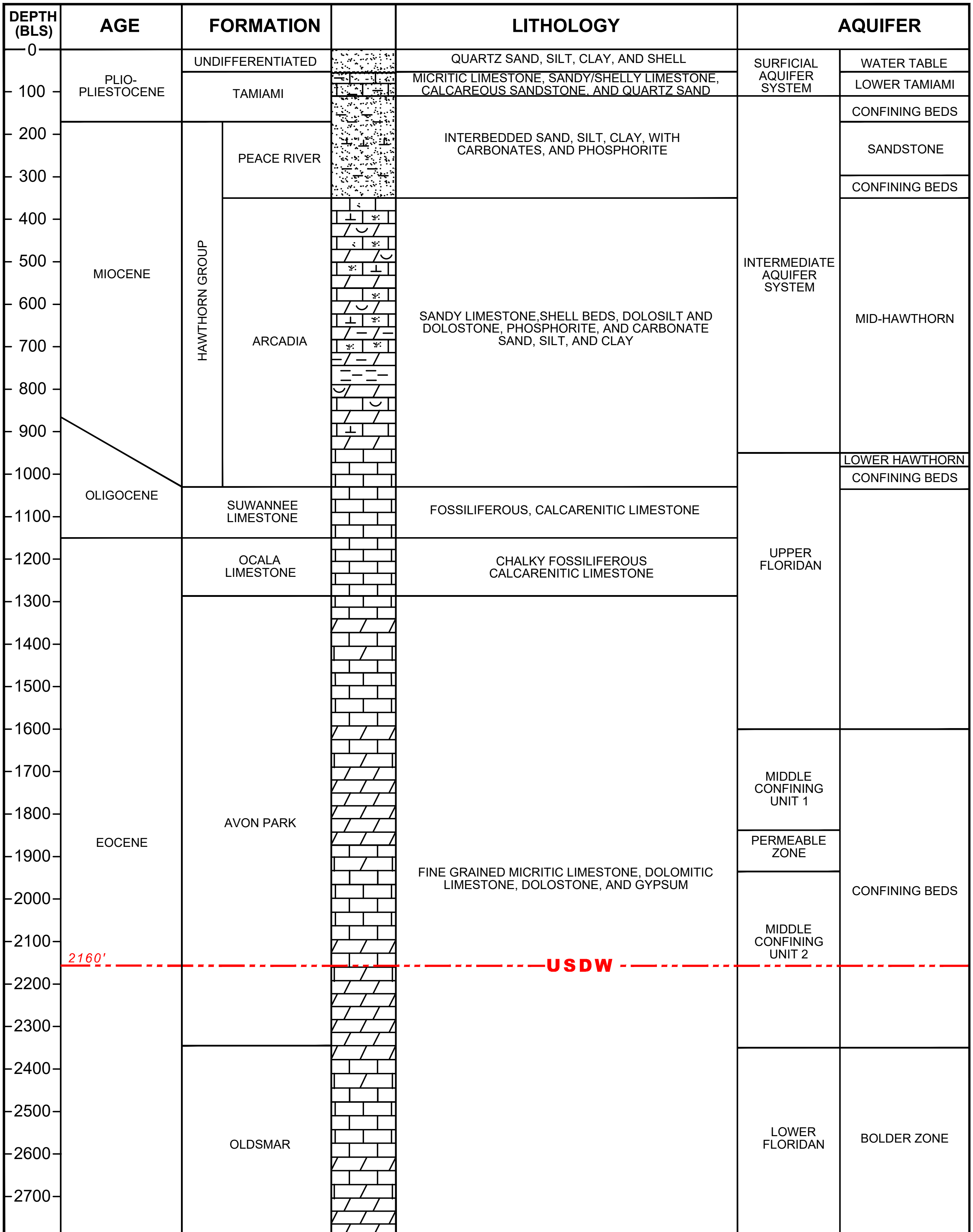
PROJECT NAME: NOBLES GRADE PROSPECT

PROJECT NUMBER: 17620-02

DECEMBER 2020

FIGURE 10. REGIONAL STRUCTURAL FAULTS AND ONE HALF MILE AREA OF REVIEW.

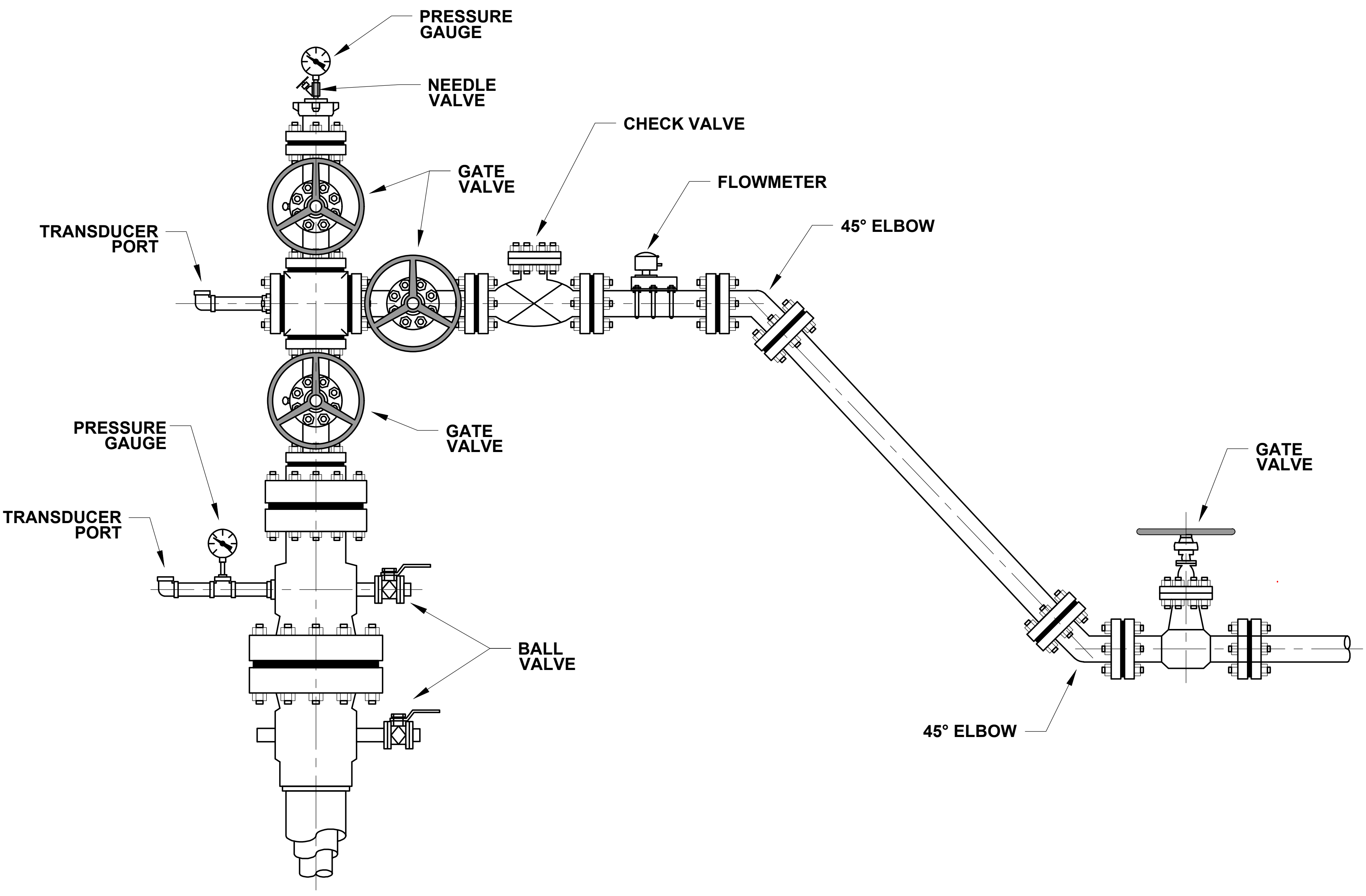


PROJECT NAME: TAMIAMI CLASS II UIC WELL

PROJECT NUMBER: 17620-02

DECEMBER 2020

FIGURE 11. GENERALIZED HYDROSTRATIGRAPHIC COLUMN AND ESTIMATED BASE OF THE USDW AT THE PROJECT SITE.



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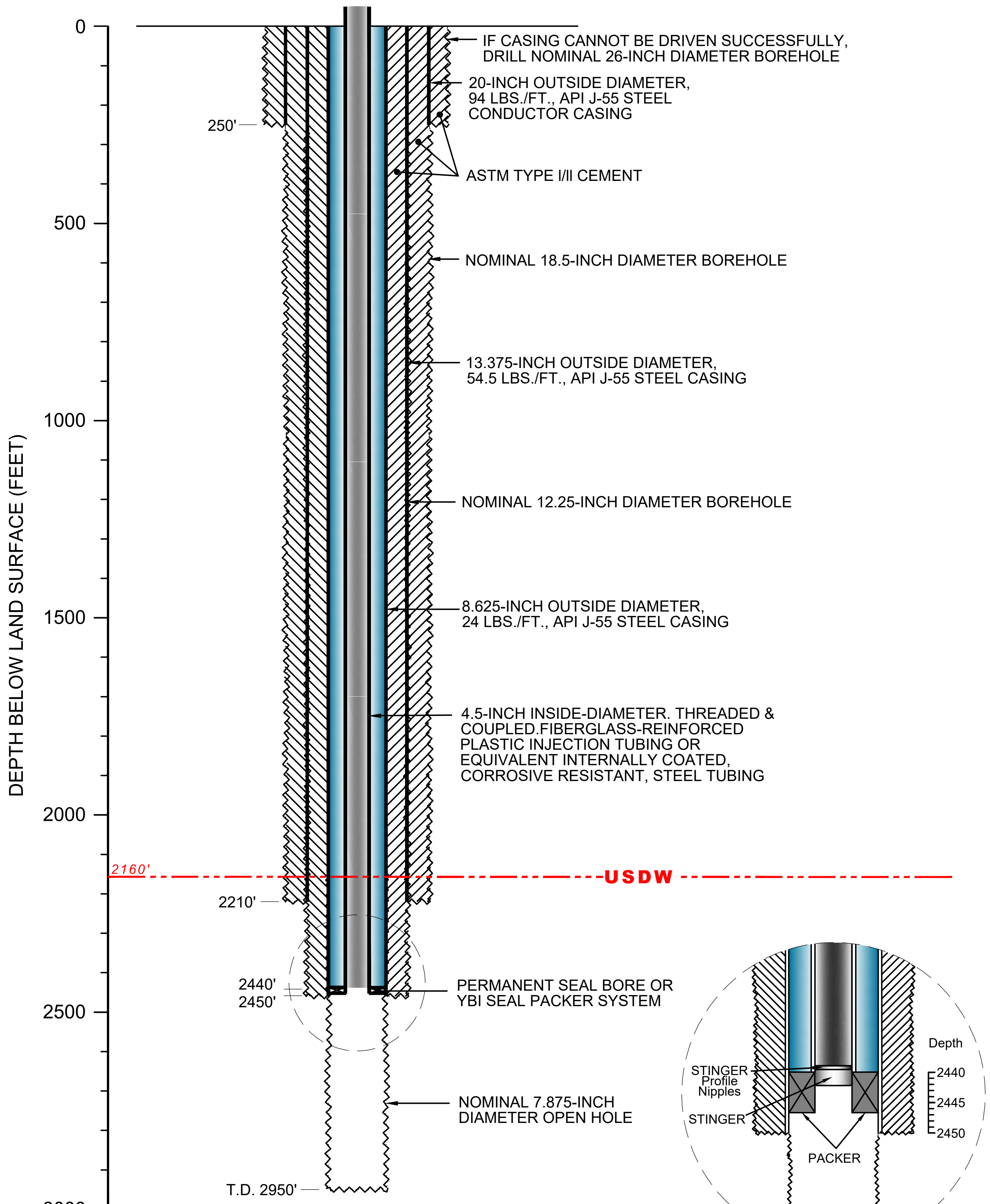
PROJECT NAME: TAMIAMI CLASS II UIC WELL

PROJECT NUMBER: 17620-02

DECEMBER 2020

NOT TO SCALE

FIGURE 12. SALTWATER DISPOSAL WELL HEADER SCHEMATIC.



NOTE: CENTRALIZERS PLACED APPROXIMATELY EVERY 50-FEET ON CASING OR ONE PER CASING JOINT

Water Science Associates	PROJECT NAME: TAMIAMI CLASS II UIC WELL	
	PROJECT NUMBER: 17620-02	DECEMBER 2020

FIGURE 13. SALTWATER DISPOSAL WELL BELOW GRADE SCHEMATIC.

TABLES

Tables 1 through 9

Table 1
Oil and Gas Well Data within One-Half Mile of Project Site
Tamiami Prospect Class II Injection Well Application
Project No. 17620-02

STATUS	WELL	OPERATOR	SECTION TOWNSHIP RANGE	NORTHING	EASTING	FORMATION	TOP (ft. BLS)	BOTTOM (ft. BLS)	TOTAL DEPTH (ft.)
NOT APPLICABLE									

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Table 2
Water Use Permits within One-Half Mile of Project Site
Tamiami Prospect Class II Injection Well Application
Project No. 17620-02

PERMIT No.	OWNER	PROJECT	NORTHING	EASTING	USE	AQUIFER	ANNUAL AVERAGE DAILY ALLOCATION	MAXIMUM MONTHLY
NOT APPLICABLE								

Table 3
Landownerswithin One-Quarter Mile of Project Site
Tamiami Prospect Class II Injection Well Application
Project No. 17620-02

OWNER	OWNER ADDRESS	PARCEL No.
NATIONAL PARK SERVICES	2975 HORSESHOE DR S, STE 800, NAPLES, FLORIDA 34104-6133	00542240001
NATIONAL PARK SERVICES	2975 HORSESHOE DR S, STE 800, NAPLES, FLORIDA 34104-6133	00542960006
NATIONAL PARK SERVICES	2975 HORSESHOE DR S, STE 800, NAPLES, FLORIDA 34104-6133	00543040006
NATIONAL PARK SERVICES	2975 HORSESHOE DR S, STE 800, NAPLES, FLORIDA 34104-6133	00552960009

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Table 4
Formation Testing Program
Tamiami Prospect Class II Injection Well Application
Project No. 17620-02

TEST	PARAMETER MEASURED	PHASE OF TESTING	PURPOSE OF TEST
Well Logs	Physical/chemical characteristics of formation	Drilling	Logging helps to give petrophysical and geological information of the formations. Most chemical and physical characteristics can be determined from these logs.
Casing Hole Dynamic Testing	Formation pressures, formation TDS	Drilling	CDHT logs can help to give a baseline for reservoir injectivity.
Borehole Geophysics	Borehole diameter, gamma radiation, resistivity, electrical potential, temperature, direction and reate of flow in borehole	Drilling / Well Completion	Recording and analyzing measurements of physical properties
Swabbing	Formation TDS	Well Completion	Formation fluid is taken via swabbing, after ensuring all drilling related fluids have been removed, for chemical testing to establish a formation baseline.
Step Rate Testing	Fracture pressure	Well Completion	Fracture pressure is estimated from SRT by finding the breakdown pressure at which fractures are created and begin to propagate.

Table 5
Well Construction Plan
Tamiami Prospect Class II Injection Well Application
Project No. 17620-02

STRING	SEATING DEPTH (ft. bls)	OUTSIDE DIAMETER (inches)	WEIGHT PER FOOT (lbs./ft.)	Grade	Threads
Conductor	250	20	94	J-55	STC
Surface	2,210	13.375	54.5	J-55	STC
Production	2,450	8.625	24	J-55	LTC
Injection	2,440	4.5	12.75	L-80	EUE

Note:

1. Centralizers will be installed every 50-feet to ensure proper cementing of the annulus.

Table 6
Well Cementing Plan
Tamiami Prospect Class II Injection Well Application
Project No. 17620-02

CASING	FLUID TYPE	FLUID NAME	DOWNHOLE VOLUME
Conductor*	Cement	Econocem	120 sack
Surface	Cement	Econocem	1,420 sack
	Cement	Halcem	760 sack
Production	Cement	Econocem	450 sack
	Cement	Halcem	280 sack

Table 7
Proposed Logs and Tests
Tamiami Prospect Class II Injection Well Application
Project No. 17620-02

HOLE SECTION	LOG TYPE	TOP (ft. BLS)	BOTTOM (ft. BLS)
Surface	Gamma/Cal/SP/Triple Combo	250	2,210
	Gamma/CBL/VDL	250	2,210
Production	Gamma/Cal/SP/Triple Combo	2,210	2,450
	CBL	2,210	2,450
Air Lift Water Quality (one sample per 20 feet)		1,950	2,450

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Table 8
Contingency Plan
Tamiami Prospect Class II Injection Well Application
Project No. 17620-02

FAILURE EVENT	FAILURE INDICATOR (CONSTANT RATE INJECTION)	FAILURE CONFIRMATION	COMMENTS
Plugged Perforations	Tubing Pressure Increase	Well performance does not improve	Most common problem, more likely to occur with decrease injectate quality
Tubing Leak	Annulus Pressure Increase	Mechanical integrity testing, inspect tubing during workover	Fairly common occurrence, more likely to occur the longer the tubing has been used
Packer Leak	Annulus Pressure Increase	Mechanical integrity testing, pull and inspect packer during workover	Common occurrence, more likely to occur as the well ages
Casing Leak Above Packer	Annulus Pressure Decrease	Mechanical integrity testing, casing inspection or pressure test	Uncommon occurrence, more likely to occur as well ages

Table 9
Representative Injectate Chemistry of South Florida Oilfield Brines
Tamiami Prospect Class II Injection Well Application
Project No. 17620-02

DATE	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	CHLORIDE	SULFATE	TOTAL DISSOLVED SOLIDS	REMARKS	SOURCE
October 23, 1943	30,980	2,760	66,750	---	165,500	310	266,510	Humble Oil & Refining Company. Sampled from stock tank. Producing section 11,613-11,626, surface elevation 24 feet	FDEP Oculus
December 10, 1943	28,100	4,000	51,000	4,700	145,000	260	240,600	Humble Oil & Refining Company to Mr. H. Gunter, State Geologist	FDEP Oculus
December 1943	25,204	3,110	58,491	4,700	143,601	275	230,827	Specific gravity 1.162 at 60.1°F. Drill stem test for discovery well. Permit 42. Analysis by BM. References: Gunter (1945, p. 18); Babcock (1962, p. 20).	http://sofia.usgs.gov/publications/papers/pp1403g/brine.html
January 27, 1944	32,020	1,265	65,576	---	161,500	220	260,718	Humble Oil & Refining Company. Gulf Coast Realities #1. Depth 11,626	FDEP Oculus
May 24, 1945	20,523	2,338	74,493	---	158,000	224	255,694	Humble Oil & Refining Company. Gulf Coast Realities Corp No 1.	FDEP Oculus
June 19, 1959	27,730	4,080	50,980	350	140,000	408	246,000	Drill stem test. Permit 278. Analysis by GS, No. 17682.	http://sofia.usgs.gov/publications/papers/pp1403g/brine.html
November 1964	21,100	2,880	55,600	2,850	131,000	1,030	271,000	Drill stem test. Permit 314. Analysis by GS, No. MSF 170.	http://sofia.usgs.gov/publications/papers/pp1403g/brine.html
November 13, 1964	21,600	2,970	51,500	2,920	129,000	415	209,000	Pumped sample. Permit 315. Analysis by GS, No. OKE 19.	http://sofia.usgs.gov/publications/papers/pp1403g/brine.html
June 1965	23,800	3,400	48,300	3,150	129,000	139	207,000	Density 1.16 g/cm3 (grams per cubic centimeter) at 68.0°F. Drill stem test for nonproducing wildcat Permit 222. Analysis by GS, No. 8655.	http://sofia.usgs.gov/publications/papers/pp1403g/brine.html
November 7, 1965	6,910	3,010	53,500	2,030	108,000	1,380	175,000	Density 1.134 g/cm3 at 68.0°F. Pumped sample. Permit 167. Analysis by GS, No. 8016.	http://sofia.usgs.gov/publications/papers/pp1403g/brine.html
August 1, 1965	27,700	4,770	56,900	3,950	152,000	665	254,000	Density 1.204 g/cm3 at 68.0°F. Drill stem test. Permit 331. Analysis by GS, No. MSF 546.	http://sofia.usgs.gov/publications/papers/pp1403g/brine.html
December 1977	31,700	4,070	65,600	--	164,570	215		Composite injection into SDS No. 1, well 2. Permit 102. Analysis by PL. Source: Exxon Co.	http://sofia.usgs.gov/publications/papers/pp1403g/brine.html
December 29, 1977	28,448	4,439	60,292	--	156,000	130	249,600	Specific gravity 1.177 at 73.0°F. Composite injected into SDS No. 2, well 1. Permit 856. Analysis by PL. Source: Exxon Co.	http://sofia.usgs.gov/publications/papers/pp1403g/brine.html
December 29, 1977	27,635	5,425	57,445	--	153,000	140	244,000	Specific gravity 1.176 at 73.0°F. Composite injected into SDS No. 1, well 1. Permit 761. Analysis by PL. Source: Exxon Co.	http://sofia.usgs.gov/publications/papers/pp1403g/brine.html
December 29, 1977	26,010	4,192	62,896	--	155,000	140	248,500	Specific gravity 1.176 at 73.0°F. Composite injected into SDS No. 1, well 1. Permit 812. Analysis by PL. Source: Exxon Co.	http://sofia.usgs.gov/publications/papers/pp1403g/brine.html
February 1, 1978	23,165	3,699	65,154	--	152,000	140	244,000	Specific gravity 1.171 at 68.0°F. Composite injected into SDS No. 1, well 1. Permit 491. Analysis by PL. Source: Exxon Co.	http://sofia.usgs.gov/publications/papers/pp1403g/brine.html
February 1, 1978	23,165	3,946	62,730		149,000	140	239,000	Specific gravity 1.170 at 68.0°F. Composite injected into SDS No. 2, well 1. Permit 748. Analysis by PL. Source: Exxon Co.	http://sofia.usgs.gov/publications/papers/pp1403g/brine.html
July 9, 1997	25,560	2,745	73,397	---	166,500	180	268,439	Baker Hughes analysis for Calumet Florida Well 19	FDEP Oculus
October 2, 2012	30,600	7,564	60,830	---	170,000	195	---	Baker Highes analysis for Breitburn, Racoon Point 34#5	FDEP Occulus
AVERAGE:	25,366	3,719	60,075	3,081	148,877	348	241,758		

Notes:
1. Modified from Lampl Herbert Consultants, Inc. (2012) Oil & Gas Drilling Permit Application 1343: BreitBurn Florida LLC Oleum Corporation 35-5 SWDW
2. Concentrations in milligrams per Liter (MG/L)

Water Science Associates

EXHIBIT 1

United States Environmental Protection Agency Underground Injection Control Program Class II Permit Application Completeness Review Checklist

Water Science Associates

United States Environmental Protection Agency
Underground Injection Control (UIC) Program
Class II Permit Application Completeness Review Checklist

Permit Number:	
Well Name: Tamiami SWD#1	
Well Type: ☐ Class II EOR ■ Class II SWD ☐ Class II Commercial SWD	
Permit Applicant: Burnett Oil Co., Inc.	
Date Application Received:	
Application Reviewed By:	

CHECK BOX IF ITEM IS PROVIDED; IF NOT APPLICABLE, WRITE "NA"

■ Completed Permit Application Form 7520-6, including signature of an authorized representative

Attachment A. Maps and Area of Review

■ **I. Well Location(s) and Permitted Area Description (if area permit)** (40 CFR 144.26; 144.33)

■ **II. Area of Review Size Determination – fixed radius or equation** (40 CFR 144.6)

III. Maps (40 CFR 144.31; 146.24)

Topographic Map extending one-mile beyond facility property boundary showing:
- ■ injection well, well pad, and project area
- ■ area of review boundary
- ■ outcrops of injection and confining formation, *if present*
- ■ surface water intake and discharge structures, *if present*
- ■ hazardous waste treatment, storage or disposal facility, *if present*

Map showing within ¼ - mile beyond facility property boundary or AOR (whichever is larger):
- ■ name and location of production wells, injection wells, abandoned wells, dry holes, and all water wells, noting its type (public water system, domestic drinking water, stock, etc.), *if present*
- ■ springs and surface bodies of waters, *if present*
- ■ mines (surface and subsurface) and quarries, *if present*
- ■ residences, schools, hospitals, and roads, *if present*

IV. Area of Review (AOR) Wells and Corrective Action Plan (CAP) (40 CFR 144.55; 146.24)
- ■ tabulation of AOR wells, *if present*
- ■ well bore diagrams, CBL, completion records of AOR wells, *if available*
- ■ AOR CAP, *if applicable*

V. Landowner Information (40 CFR 144.31 and part 147)
- ■ list of landowners and address within ¼-mile
- ■ evidence of notification to landowner of intent to apply for permit, *if applicable*

Attachment B. Geological and Geophysical Information

I. Geological Data (40 CFR 146.24)
- ■ list of formations from surface to the base of the injection well, identifying all the USDWs and confining and injection zone(s). List includes the lithologic description, geological name, thickness, depth, and total dissolved solids (TDS) concentrations from these formations, *if known*
- ■ source of information for the geologic data and formation TDS

- ■ porosity and permeability of injection formation, *if available*
- ■ geological cross-sections, *if available*
- ■ known or suspected faults and fracture systems within AOR. If identified, provide proximity to the injection zone and affect fault/fracture system may have on the injection activities
- ■ history of seismic activity in the area and proximity to crystalline (i.e., granitic) basement, *if applicable*

II. Formation Testing Plan (40 CFR 146.22)

- ■ fluid pressure
- ■ estimated fracture pressure
- ■ physical and chemical characteristics of the injection zone

Attachment C. Well Construction/Conversion Information

I. Well Schematic Diagram (40 CFR 146.24)

Detailed proposed well schematic diagram that includes:

- ■ identification of USDWs and confining and injection zones
- ■ casing and cementing details, including demonstrated or calculated top of cement
- ■ tubing and packer, *if applicable*
- ■ open hole or perforated intervals
- ■ surface trace, *if horizontal or deviated well*

If conversion to injection well:

- ■ current well schematic diagram

II. Well Construction or Conversion Procedures (40 CFR 144.52; 146.22; 146.24)

Description of well construction or conversion procedures that includes:

- ■ proposed logs and other tests conducted during the drilling and construction of new well(s)
- ■ proposed stimulation plan(s), *if applicable*
- ■ description of alarms and shut-down systems at the well, *if applicable*

If conversion to injection well:

- ■ well completion and cementing records
- ■ previously run logs/tests

Attachment D. Injection Operation and Monitoring Program (40 CFR 146.23; 146.24)

- ■ flow diagram of fluid flow through facility
- ■ contingency plan(s) to respond to with well failures
- ■ drawing of the surface construction
- ■ location of monitoring ports (show on the map(s) referenced in section A.III. above)
- ■ description of sampling and monitoring devices to monitor the nature of the injected fluids, injection pressure, annulus pressure (if applicable), flowrate, and cumulative volume
- ■ description of manifold monitoring program and how the program is comparable to individual well monitoring

Operating Data Information:

- ■ average and maximum daily rate and volume of fluids to be injected
- ■ average and maximum injection pressure
- ■ source(s) of injection fluids (including field and formation names)
- ■ proposed annular fluid, *if applicable*
- ■ analysis of the chemical and physical characteristics of the injection fluid. At a minimum, this should include pH, specific gravity, TDS, and conductivity

Attachment E. Plugging and Abandonment (P&A) Plan (40 CFR 144.31; 144.51; 146.24)

- ■ P&A plan of the well on EPA Form 7520-19

P&A diagram that includes: ■ type, and number of plugs to be used ■ placement of each plug including the elevation of top and bottom ■ type, grade, and quantity of cement to be used ■ method of placement of the plugs ■ at least one cost estimates from an independent firm in the business of plugging and abandoning wells for third party (EPA) to complete proposed P&A plan
Attachment F. Financial Assurance (40 CFR 144.52) ■ evidence of financial resources, such as a surety bond or financial statement, necessary to close, plug, or abandon the well
Attachment G. Site Security and Manifest Requirements (Commercial Wells Only; Form 7520) ■ site security plan ■ description of manifest system
Attachment H. Aquifer Exemption (AE) (40 CFR 144.7; 146.4) ■ supporting documentation for proposed AE, *if applicable*
Attachment I. Existing EPA Permits (40 CFR 144.31) ■ list of existing EPA permits, *if applicable*
Attachment J. Description of Business (40 CFR 144.31) ■ description of the nature of the business
Attachment K. Optional Additional Project Information (40 CFR 144.4) ■ <u>The Wild and Scenic Rivers Act, 16 U.S.C. 1273 et seq.</u> list of national wild and scenic rivers that may be impacted by the activities associated with proposed project, *if applicable* ■ <u>The National Historic Preservation Act of 1966, 16 U.S.C. 470 et seq.</u> list of properties listed or eligible for listing in the National Register of Historic Places. If available, historic and cultural resource survey(s) that have been conducted, *if applicable* ■ <u>The Endangered Species Act, 16 U.S.C. 1531 et seq.</u> list of endangered or threatened species that may be affected by the activities associated with proposed project. If available, previous endangered or threatened species surveys that have been conducted, *if applicable* ■ <u>The Coastal Zone Management Act, 16 U.S.C. 1451 et seq.</u> list of coastal zones that may be affected by the activities associated with the proposed project, *if applicable*

EXHIBIT 2

United States Environmental Protection Agency Form 7520-6 (Rev. 4-19)

OMB No. 2040-0042 Approval Expires 4/30/2022

United States Environmental Protection Agency

Underground Injection Control
Permit Application for a Class II Well

(Collected under the authority of the Safe Drinking Water Act. Sections 1421, 1422, and 40 CFR Part 144)

For Official Use Only	
Date Received	
Permit Number	

Read Attached Instructions Before Starting

I. Owner Name, Address, Phone Number and/or Email

Burnett Oil Co., Inc.
Burnett Plaza, Suite 1500
801 Cherry Street, Unit No. 9
Fort Worth, Texas 76102-6881
c/o Mr. W. Hanna
(817) 332-5108

II. Operator Name, Address, Phone Number and/or Email

Burnett Oil Co., Inc.
Burnett Plaza, Suite 1500
801 Cherry Street, Unit No. 9
Fort Worth, Texas 76102-6881
c/o Mr. W. Hanna
(817) 332-5108

III. Commercial Facility

- [x] Yes
- [ ] No

IV. Ownership

- [x] Private
- [ ] Federal
- [ ] State/Tribal/ Municipal

V. Permit Action Requested

- [x] New Permit
- [ ] Permit Renewal
- [ ] Modification
- [ ] Add Well to Area Permit
- [ ] Other

VI. SIC Code(s)

1311, 1381, 1382, 1389

VII. Indian Country

- [ ] Yes
- [x] No

VIII. Type of Permit (For multiple wells, use additional page(s) to provide the information requested for each additional well)

- [x] A. Individual
- [ ] B. Area

Number of Wells: 1

Well Field and/or Project Names: Tamiami SWD #1 / Tamiami Prospect

IX. Class and Type of Well (see reverse)

A. Class	B. Type (enter code(s))	C. If type code is "X," explain.
II	D	

X. Well Status

- [ ] A. Operating — Date Injection Started:
- [ ] B. Conversion — Date Well Constructed:
- [x] C. Proposed

XI. Well Information

API Number: TBD
Permit (or EPA ID) Number: TBD
Full Well Name: Tamiami SWD #1

XII. Location of Well or, for Multiple Wells, Approximate Center of Field or Project

Locate well in two directions from nearest lines of quarter section and drilling unit

Surface Location

SE 1/4 of SE 1/4 of Section 36 Township 51S Range 34E

250 ft. from (N/S) S Line of quarter section
140 ft. from (E/W) W Line of quarter section.

Latitude: N025° 58' 56.65"
Longitude: W080° 52' 46.03"

XIII. Attachments

In addition to this form, complete Attachments A-U (as appropriate for the specific well class) on separate sheets. Submit complete information, as required in the instructions and list all attachments, maps or other figures, by the applicable letter.

XIV. Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possiblity of fine and imprisonment. (Ref. 40 CFR § 144.32)

Name and Official Title *(Please Type or Print)*	Signature	Date Signed
Welsey Hanna, Eng Manager/New Ventures	WH	04/13/2021

EXHIBIT 3

Agent of Authorization Letter

BURNETT OIL CO., INC.

7 December 2020

Re: Agent of Authorization for Water Science Associates

To Whom It May Concern:

This letter will serve as notice that Michael C. Alfieri, P.G., P.Hg, CGWP of the hydrogeologic firm Water Science Associates, Inc. of Fort Myers, Florida, is authorized to act as an agent on behalf of Burnett Oil Co., Inc. (Applicant/Permittee) with respect to hydrogeologic and water resource/supply permitting in the State of Florida. This authorization may be revoked by the Applicant/Permittee at any time.

The Division of Corporations of the Office of the Secretary of State designates Burnett Oil. Co. as a foreign corporation authorized to do business in the State of Florida.

If you have any questions or need any additional information please feel free to contact me by phone at 817-583-8730 or email at lgarvis@burnettoil.com.

Respectfully,

Leslie Garvis

Leslie Garvis
Regulatory and Government Affairs Manager

EXHIBIT 4

Authorization to Transact Business in the State of Florida

FLORIDA DEPARTMENT OF STATE
Division of Corporations

April 18, 2013

FLORIDA FILING & SEARCH SERVICES, INC

,

Qualification documents for BURNETT OIL CO., INC. were filed on April 17, 2013 and assigned document number F13000001668. Please refer to this number whenever corresponding with this office.

Your corporation is authorized to transact business in Florida as of the file date.

The certification you requested is enclosed.

To maintain "active" status with the Division of Corporations, an annual report must be filed yearly between January 1st and May 1st beginning in the year following the file date or effective date indicated above. If the annual report is not filed by May 1st, a $400 late fee will be added.

A Federal Employer Identification Number (FEI/EIN) will be required when this report is filed. Contact the IRS at 1-800-829-4933 for an SS-4 form or go to www.irs.gov.

Please notify this offfice if the corporate address changes.

Should you have any questions regarding this matter, please contact this office at (850) 245-6052.

Justin M Shivers
Regulatory Specialist II
New Filing Section
Division of Corporations

Letter Number: 813A00009271

Account number: FCA000000015

Amount charged: 87.50

www.sunbiz.org

Division of Corporations - P.O. BOX 6327 -Tallahassee, Florida 32314

State of Florida

Department of State

I certify from the records of this office that BURNETT OIL CO., INC., is a corporation organized under the laws of Texas, authorized to transact business in the State of Florida, qualified on April 17, 2013.

The document number of this corporation is F13000001668.

I further certify that said corporation has paid all fees due this office through December 31, 2013, and its status is active.

I further certify that said corporation has not filed a Certificate of Withdrawal.

Given under my hand and the
Great Seal of the State of Florida
at Tallahassee, the Capital, this the
Eighteenth day of April, 2013

Ken Detzner
Secretary of State

CR2EO22 (1-11)

State of Florida

IN GOD WE TRUST

Department of State

I certify the attached is a true and correct copy of the application by BURNETT OIL CO., INC., a Texas corporation, authorized to transact business within the State of Florida on April 17, 2013 as shown by the records of this office.

The document number of this corporation is F13000001668.

Given under my hand and the
Great Seal of the State of Florida
at Tallahassee, the Capital, this the
Eighteenth day of April, 2013

GREAT SEAL OF THE STATE OF FLORIDA
IN GOD WE TRUST

Ken Detzner

Ken Detzner
Secretary of State

CR2EO22 (1-11)

MEMORANDUM OF OIL AND GAS LEASE

STATE OF FLORIDA §
§ **KNOW ALL MEN BY THESE PRESENTS:**
COUNTY OF COLLIER §

This Memorandum of Oil and Gas Lease ("Memorandum") is executed by and between Collier Resources Company, LLC, whose address is 2600 Golden Gate Parkway, Suite 112, Naples, Florida 34105-3200 ("Lessor") and Burnett Oil Company, whose address is 801 Cherry Street – Unit #9, Burnett Plaza-Suite 1500, Fort Worth, Texas 76102-6881 ("Lessee").

WHEREAS, Lessor and Lessee entered into that certain Oil and Gas Lease (the "Lease") dated February 14, 2019 (the "Effective Date"), covering the following described tracts of lands (the "Lands"), situated in Collier County, Florida:

See Exhibit "A" attached hereto and made a part hereof

WHEREAS, said Lease has been executed and acknowledged by Lessor and provides for a term of five (5) years from the Effective Date, subject to other provisions contained in the Lease. At the expiration of the primary term, the Lease shall continue in full force and effect so long thereafter oil and/or gas, sulphur and/or associated liquid or liquefiable hydrocarbons are produced from the Lands.

The purpose of this Memorandum is to evidence of record the existence of said Lease and Lessor and Lessee have agreed to file this Memorandum among the records of Collier County, Florida, in lieu of filing said Lease.

This Memorandum shall be binding upon Lessor and Lessee and their respective heirs, successors, representatives and assigns. In the event of a conflict between the terms and provision of this Memorandum and the terms and provisions of the Lease, the terms and provisions of the Lease shall govern and control.

IN WITNESS WHEREOF, this instrument is executed and effective for all purposes as of the Effective Date referenced above.

LESSOR(S):

Collier Resources Company, LLP, a Florida
Limited liability partnership, their authorized agenda
By: Barron Collier Resources, LLLP, a Florida
Limited liability partnership, a partner
By Barron Collier Corporation, its sole and general partner
And the BCR Representative

INSTR 5743254 OR 5655 PG 578
RECORDED 7/24/2019 10:24 AM PAGES 4
CLERK OF THE CIRCUIT COURT AND COMPTROLLER
COLLIER COUNTY FLORIDA
REC $35.50

By: Tom Jones
Tom Jones, Authorized Agent

And by: Collier Enterprises Management, Inc., a
Florida corporation, the CE Representative

By: ______________________
Christian Spilker, Vice-President

LESSEE:

Burnett Oil Company
By: Burnett Oil Co., Inc.,
Managing General Partner

By: ______________________
Denny C. Whinery
Vice-President of Business Development

ACKNOWLEDGEMENT

STATE OF FLORIDA §
§
COUNTY OF COLLIER §

This instrument was acknowledged before me on the 22 day of ~~February~~ MARCH 2019 by Tom Jones, as Authorized Agent of Collier Resources Company, LLP, a Florida Limited liability partnership, their authorized agenda, By: Barron Collier Resources, LLLP, a Florida Limited liability partnership, a partner By Barron Collier Corporation, its sole and general partner and the BCR Representative.

My Commission Expires:

1/14/2023

Sabina E. Hardy
Notary Public

SABINA E. HARDY
MY COMMISSION # GG 287225
EXPIRES: January 14, 2023
Bonded Thru Notary Public Underwriters

NOTARY PUBLIC STATE OF FLORIDA

STATE OF FLORIDA §
§
COUNTY OF COLLIER §

This instrument was acknowledged before me on the 22nd day of February 2019 by Christian Spilker, as Vice-President of Collier Enterprises Management, Inc., a Florida corporation, the CE Representative.

My Commission Expires:

8/17/2020

Notary Public

NOTARY PUBLIC STATE OF FLORIDA

Valerie L. Pike
Notary Public - State of Florida
Commission # GG 22100
Expires 08/17/2020

STATE OF TEXAS §
§
COUNTY OF TARRANT §

This instrument was acknowledged before me on the 9th day of ~~February~~ April 2019 by Denny C. Whinery, as Vice-President of Business Development of Burnett Oil Co., Inc., a Texas corporation, as Managing General Partner of Burnett Oil Company, a General Partnership on behalf of said partnership.

My Commission Expires:

04-13-2021

Ruth G. Trevino
Notary Public, State of Texas

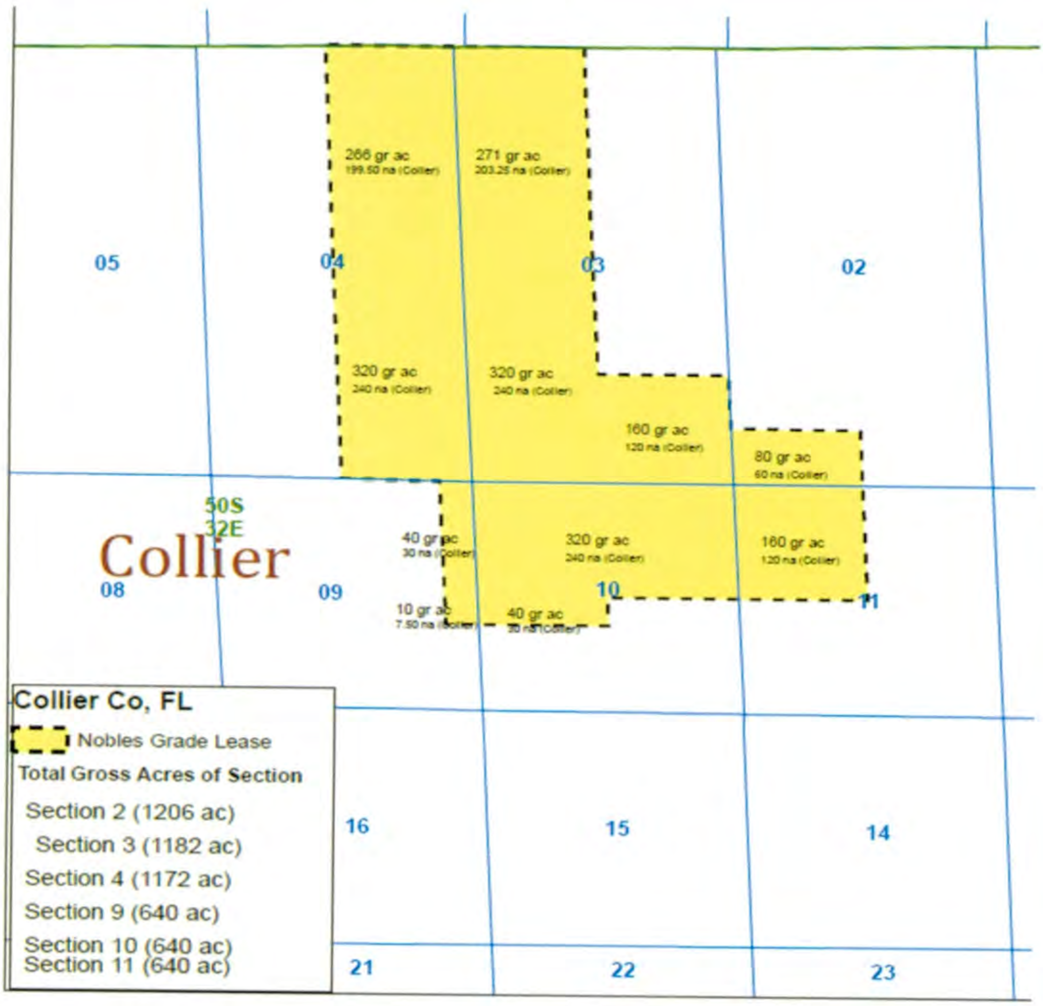
NOTARY PUBLIC STATE OF TEXAS

RUTH G. TREVINO
Notary Public
STATE OF TEXAS
Notary ID # 544594-9
My Comm. Exp. April 13, 2021

EXHIBIT “A”

Attached to and made a part of that certain Memorandum of Oil and Gas Lease dated February 14, 2019 by and between Collier Resources Company, LLC, Lessor and Burnett Oil Company, Lessee

Section 2-T50S-R32E:	S/2 S/2 SW/4	80 Gross Acres	Collier Co., FL
Section 3-T50S-R32E:	W/2; S/2 SE/4	751 Gross Acres	Collier Co., FL
Section 4-T50S-R32E:	E/2	586 Gross Acres	Collier Co., FL
Section 9-T50S-R32E:	E/2E/2NE/4; NENESE	50 Gross Acres	Collier Co., FL
Section 10-T50S-R32E:	N/2; N/2N/2SW/4	360 Gross Acres	Collier Co., FL
Section 11-T50S-R32E:	NW/4	160 Gross Acres	Collier Co., FL
		1987 Gross Acres	

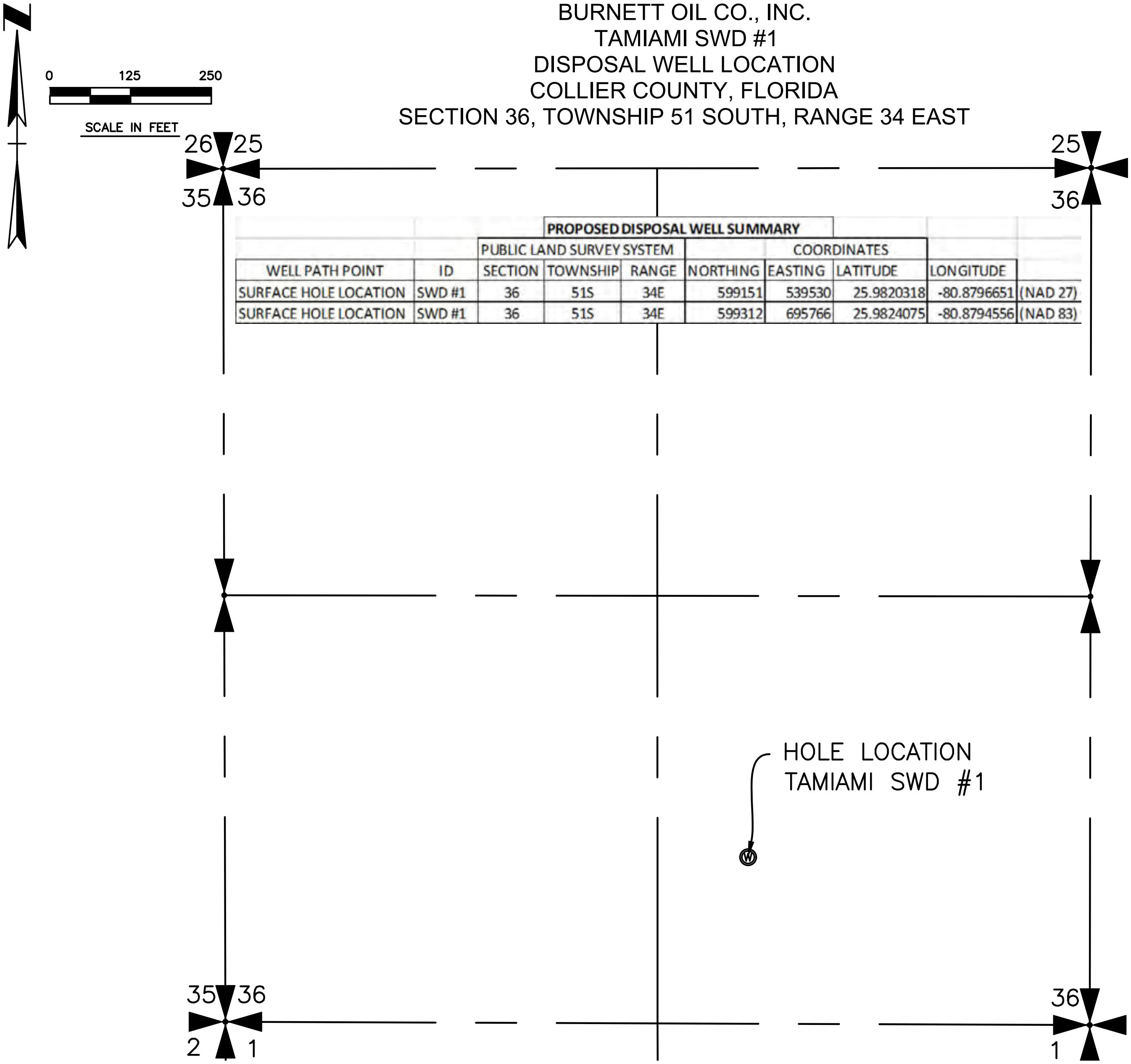


END OF EXHIBIT “A”

EXHIBIT 5

Well Plat

BURNETT OIL CO., INC.
TAMIAMI SWD #1
DISPOSAL WELL LOCATION
COLLIER COUNTY, FLORIDA
SECTION 36, TOWNSHIP 51 SOUTH, RANGE 34 EAST



PROPOSED DISPOSAL WELL SUMMARY									
		PUBLIC LAND SURVEY SYSTEM			COORDINATES				
WELL PATH POINT	ID	SECTION	TOWNSHIP	RANGE	NORTHING	EASTING	LATITUDE	LONGITUDE	
SURFACE HOLE LOCATION	SWD #1	36	51S	34E	599151	539530	25.9820318	-80.8796651	(NAD 27)
SURFACE HOLE LOCATION	SWD #1	36	51S	34E	599312	695766	25.9824075	-80.8794556	(NAD 83)

NOTES:
1) COORDINATES SHOWN HEREON ARE BASED ON NAD 27 AND NAD 83 STATE PLANE COORDINATE SYSTEM, FLORIDA EAST ZONE (0901)
2) SPECIFIC PURPOSE SURVEY FOR WELL SITE LOCATIONS. BASIS OF BEARINGS: REFERENCED TO FLORIDA STATE PLANE COORDINATE SYSTEM (0901) NAD 83 EAST ZONE ESTABLISHED BY RTK GPS UTILIZING THE FLORIDA PERMANENT REFERENCE NETWORK AS A CONTINUOUSLY OPERATING STATION.
3) SECTION LINES ON THIS SURVEY HAVE BEEN REESTABLISHED IN APPROXIMATE LOCATION BY USE OF LABINS. THIS METHOD WAS UTILIZED BECAUSE AN INORDINATE AMOUNT OF SURVEYING WOULD HAVE TO BE ACCOMPLISHED IN ORDER TO ESTABLISH EXACT SECTION CORNERS.

DATE OF SURVEY:
NEW OR EXISTING SITE: NEW
ADDITIONAL INFORMATION: NONE

CERTIFICATE OF SURVEYOR:

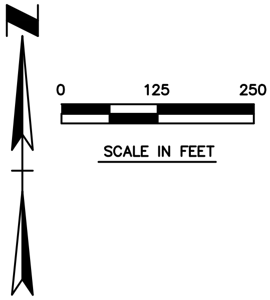
I hereby certify that this sketch and legal description meets the Standards of Practice set fourth in Rules 5J-17.050-.053, of the Florida Administrative Code, adopted by the Florida board of professional surveyors and mappers, pursuant to chapter 472.027 of the Florida statutes.

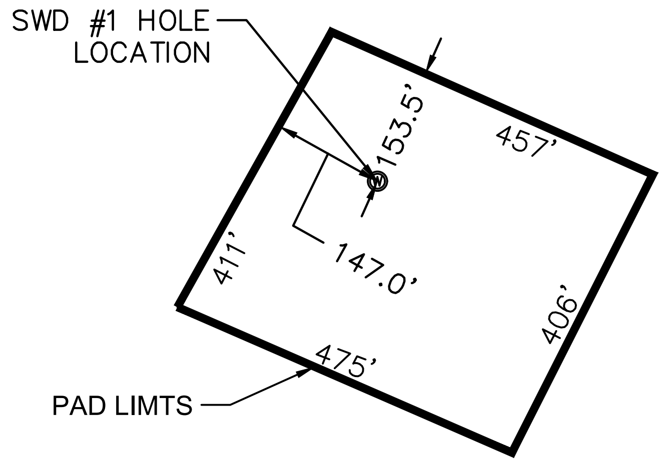
Thomas E. Whidden
Professional Surveyor and Mapper
Florida Certification Number 6225

Whidden Surveying & Mapping, Inc.
9200 Belvedere Road, Ste 114
Royal Palm Beach, FL 33411
Phone: 561.790.5515
Fax: 561.790.6557
www.whiddensurveying.com
Licensed Buisness No. 7232

DRAWN	CHECKED	DATE	SCALE	DRAWING NUMBER	SHEET
DJI	TEW	04DEC20	1"=1,000'		1 OF 2

BURNETT OIL CO., INC.
TAMIAMI SWD #1
DISPOSAL WELL LOCATION
COLLIER COUNTY, FLORIDA
SECTION 36, TOWNSHIP 51 SOUTH, RANGE 34 EAST





		PROPOSED DISPOSAL WELL SUMMARY							
		PUBLIC LAND SURVEY SYSTEM			COORDINATES				
WELL PATH POINT	ID	SECTION	TOWNSHIP	RANGE	NORTHING	EASTING	LATITUDE	LONGITUDE	
SURFACE HOLE LOCATION	SWD #1	36	51S	34E	599151	539530	25.9820318	-80.8796651	(NAD 27)
SURFACE HOLE LOCATION	SWD #1	36	51S	34E	599312	695766	25.9824075	-80.8794556	(NAD 83)

NOTES:
1) COORDINATES SHOWN HEREON ARE BASED ON NAD 27 AND NAD 83 STATE PLANE COORDINATE SYSTEM, FLORIDA EAST ZONE (0901)
2) SPECIFIC PURPOSE SURVEY FOR WELL SITE LOCATIONS. BASIS OF BEARINGS: REFERENCED TO FLORIDA STATE PLANE COORDINATE SYSTEM (0901) NAD 83 EAST ZONE ESTABLISHED BY RTK GPS UTILIZING THE FLORIDA PERMANENT REFERENCE NETWORK AS A CONTINUOUSLY OPERATING STATION.
3) SECTION LINES ON THIS SURVEY HAVE BEEN REESTABLISHED IN APPROXIMATE LOCATION BY USE OF LABINS. THIS METHOD WAS UTILIZED BECAUSE AN INORDINATE AMOUNT OF SURVEYING WOULD HAVE TO BE ACCOMPLISHED IN ORDER TO ESTABLISH EXACT SECTION CORNERS.

Whidden Surveying & Mapping, Inc.
9200 Belvedere Road, Ste 114
Royal Palm Beach, FL 33411
Phone: 561.790.5515
Fax: 561.790.6557
www.whiddensurveying.com
Licensed Buisness No. 7232

DRAWN	CHECKED	DATE	SCALE	DRAWING NUMBER	SHEET
DJI	TEW	04DEC20	1"=250'		2 OF 2

EXHIBIT 6

United States Environmental Protection Agency Form 7520-19 (Rev. 4-19)

OMB No. 2040-0042 Approval Expires 4/30/2022

United States Environmental Protection Agency

WELL REWORK RECORD, PLUGGING AND ABANDONMENT PLAN, OR PLUGGING AND ABANDONMENT AFFIDAVIT

Name and Address, Phone Number and/or Email of Permittee

Burnett Oil Co., Inc.
Burnett Plaza, Suite 1500
801 Cherry Street, Unit No. 9
Fort Worth, Texas 76102-6881
c/o Mr. W. Hanna

Permit or EPA ID Number	API Number	Full Well Name
TBD	TBD	Tamiami SWD#1

State	County
Florida	Collier

Locate well in two directions from nearest lines of quarter section and drilling unit

Latitude: N025° 58' 56.65"

Longitude: W080° 52' 46.03"

Surface Location

SE 1/4 of SE 1/4 of Section 36 Township 51S Range 34E

250 ft. from (N/S) S Line of quarter section
140 ft. from (E/W) W Line of quarter section.

Well Class	Timing of Action (pick one)	Type of Action (pick one)
☐ Class I	☐ Notice Prior to Work Date Expected to Commence	☐ Well Rework
☑ Class II		☐ Plugging and Abandonment
☐ Class III	☐ Report After Work Date Work Ended	☐ Conversion to a Non-Injection Well
☐ Class V		

Provide a narrative description of the work planned to be performed, or that was performed. Use additional pages as necessary. See instructions.

The proposed saltwater disposal well will be plugged and abandoned in accordance with USEPA guidelines and requirements when its service life is over. The plug will cement the entire wellbore from the injection zone to land surface.

Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possiblity of fine and imprisonment. (Ref. 40 CFR § 144.32)

Name and Official Title *(Please type or print)*	Signature	Date Signed
Wesley Hanna Engineering Manager/New Ventures-Burnett Oil Co., Inc	WH	04/13/2021

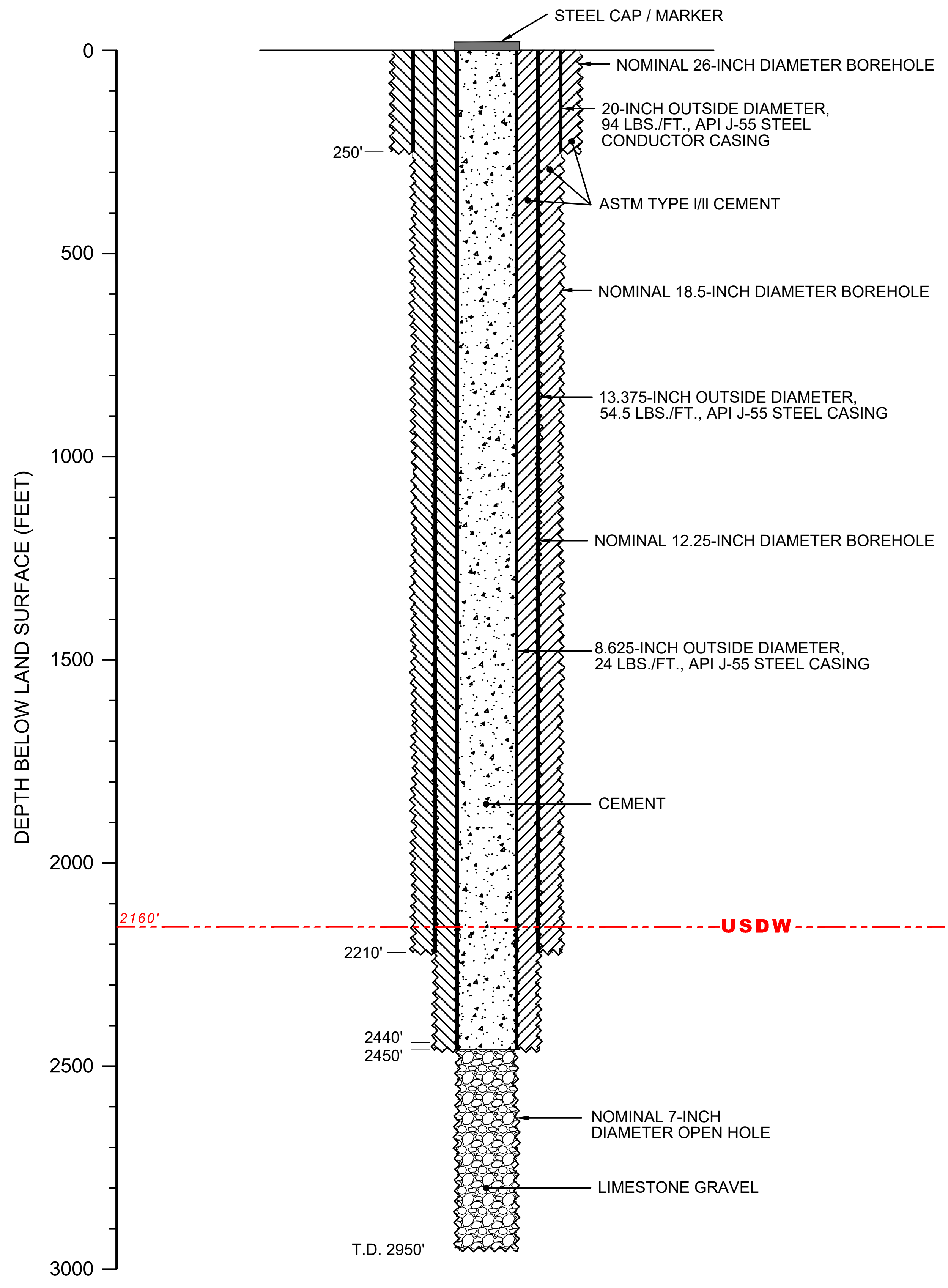
EXHIBIT 7

Plugging and Abandonment Plan

EXHIBIT 7

PLUGGING AND ABANDONMENT PLAN

1. Obtain Florida Department of Environmental Protection permit.
2. Perform mechanical integrity test.
3. Suppress the wellhead pressure with drilling mud.
4. Dismantle and remove wellhead and associated piping network.
5. Remove tubing and packer system.
6. Backfill nominal 7.875-inch diameter open borehole with crushed limestone gravel from 2,950 feet below land surface to 2,450 feet below land surface.
7. Cement the well within the 8.625-inch outside diameter production casing with ASTM Type I/II cement from 2,450 feet below land surface to surface.
8. Install and weld steel plate monument to 8.625-inch outside diameter production casing.



Water Science Associates	PROJECT NAME: TAMIAMI CLASS II UIC WELL
	PROJECT NUMBER: 17620-02 DECEMBER 2020

EXHIBT 7. SALTWATER DISPOSAL WELL PLUG AND ABANDONMENT SCHEMATIC.

EXHIBIT 8

Plugging and Abandonment Cost Estimates

From:	Paul Petrey
To:	Michael Alfieri
Subject:	RE: Class II Injection Wells Plugging and Abandonment Estimates (Collier County)
Date:	Wednesday, January 6, 2021 10:50:05 AM
Attachments:	image004.png image006.png

Michael,

"We would appreciate it if you could provide a cost estimate to plug and abandon each Class II injection well for each of the permit application (i.e., two [2] individual estimates total)."

Scope of Work
Plugging and Abandonment

1. *Obtain Florida Department of Environmental Protection permit.*
2. *Perform mechanical integrity test.*
3. *Suppress the wellhead pressure with drilling mud.*
4. *Dismantle and remove wellhead and associated piping network.*
5. *Remove tubing and packer system.*
6. *Backfill nominal 7-inch diameter open borehole with crushed limestone gravel to the base of the production casing.*
7. *Cement the well within the 8.625-inch outside diameter production casing with ASTM Type I/II cement to land surface.*
8. *Install and weld steel plate monument to 8.625-inch outside diameter production casing.*

Based on the above scope of work and information you provided, the cost to abandon the two injection wells would be:

$215,000 for the Injection Well with a TD of 2950 feet
$210,000 for the Injection Well with a TD of 2850 feet.

Thanks for considering Applied Drilling Engineering, Inc.
Paul

Paul Petrey
Applied DRILLING Engineering, Inc.
10012 North Dale Mabry Hwy,
Suite 217
Tampa, Florida. 33618

Cell (813) 695-4358
Phone(813) 269-8200
Fax (813) 968-9244
Paul@applieddrillingengineering.com
http://www.applieddrillingengineering.com/

From: Michael Alfieri <michaela@wsaconsult.com>
Sent: Tuesday, January 5, 2021 11:03 AM
Cc: Kirk Martin <kirk@wsaconsult.com>
Subject: Class II Injection Wells Plugging and Abandonment Estimates (Collier County)

I am working on two (2) Class II injection well permit applications for two (2) individual O&G prospects (referred to as "Nobles Grade Prospect" and "Tamiami Prospect") in Collier County. The US EPA requires plugging and abandonment estimates for each. The two injection wells are similar with one slightly deeper than the other (see well schematics below). We will be providing the Client with a list of prospective contractors when the Class II injection well permits are authorized and basing our list on the response to this request. We believe you have the capabilities to complete the construction of the injection wells and the ability to properly plug and abandon the wells once their service is completed. We would appreciate it if you could provide a cost estimate to plug and abandon each Class II injection well for each of the permit application (i.e., two [2] individual estimates total).

Plugging and Abandonment

1. Obtain Florida Department of Environmental Protection permit.
2. Perform mechanical integrity test.
3. Suppress the wellhead pressure with drilling mud.
4. Dismantle and remove wellhead and associated piping network.
5. Remove tubing and packer system.
6. Backfill nominal 7-inch diameter open borehole with crushed limestone gravel to the base of the production casing.
7. Cement the well within the 8.625-inch outside diameter production casing with ASTM Type I/II cement to land surface.
8. Install and weld steel plate monument to 8.625-inch outside diameter production casing.

Tuesday, January 19, 2021

Michael C. Alfieri, P.G., P.Hg., CGWP
Water Science Associates
13620 Metropolis Avenue, Suite 110
Fort Myers, Florida 33912

RE: Cost estimate to plug and abandon two (2) Class II Injection Wells (Collier County)

Dear Mr. Alfieri,

We appreciate the opportunity to be of assistance. Please find attached quote for plugging and abandoning two (2) Class II Injection Wells In Collier County (Well diagrams attached for reference)

- Tamiami Class II UIC Well
- Nobles Grade Class II UIC Well

Cost estimate to plug and abandon a Class II Injection well **$300,000 per well**

Please contact me with any questions or concerns at 561-746-2079.

Respectfully,

David W. Webb, Jr.
Vice President

A. C. Schultes of Florida, Inc.
11865 US Highway 41 South
Gibsonton, FL 33534

24 Hour Service
(813) 741-3010
Fax (813) 741-3170

January 15, 2021

Water Science Associates
Attn: Mr. Michael Alfieri, P.G., PHg., CGWP
13620 Metropolis Avenue, Suite 110
Fort Myers, FL 33912

RE: Abandonment of Nobles Grade UIC Well and Abandonment of Tamiami UIC Well

Dear Mr. Alfieri;

In accordance with your request, A.C. Schultes of Florida, Inc. (ACS) is pleased to present the following proposal based on all the information you have provided:

Scope of Services:

Nobles Grade UIC

Mobilize to site with crane and crew
Set up and prepare for annular pressure testing
Perform annular mechanical integrity test (between 4.5" FRP & 8" steel casings)
Kill the well with salt and remove wellhead and piping to access well
Remove 4.5" FRP tubing from well
Install limestone gravel from the bottom of the well to the base of the 8" casing
Install cement from the top of the gravel to land surface
Cut casing to ground level and weld plate on top
Clean up and demobe to the next well site

Tamiami UIC

Repeat the process as stated above to abandon the second UIC well

Total Estimated: $ 319,700.00

Bid Clarifications:

FEDP permit shall be provided by others
Safe, legal and stable access to each well site shall be provided by others
Water source shall be provided by others
Quote is based on a wedge type positive seal packer
ACS recommends videoing the well if it has never been videoed or if has been more than 5 years.
Payment and performance bond is included
All other services, except noted above, are excluded
This is a budgetary number

Sincerely,

Gregory Schultes

Gregory Schultes

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Fort Myers, Florida 33908
Tel.: 239-489-4444 / Fax: 239-489-4545

January 18, 2021

Mr. Michael Alfieri, P.G., P.Hg, CGWP
Water Science Associates
Ft. Myers, FL

via: michaela@wsaconsult.com

RE: TAMIAMI Plug and Abandonment Estimate for Class II Injection Well

Dear Mr. Alfieri,

I have reviewed the information you provided on the TAMIAMI Class II Injection Well. Set forth below is the estimated cost associated with the plugging and abandonment of said well.

Our total estimate for 2020 is $**231,380.00** This estimate does not include Engineering or Consulting Services.

This estimate is consistent with other such estimates we have prepared for other UIC regulated Injection Well systems around the state of Florida. This price includes all requirements for performing the work according to typical Florida Department of Environmental Protection permit conditions and other relevant guidelines.

This estimate is broken down on the detailed cost sheet provided and attached hereto.

Please contact the undersigned should you have any questions regarding this estimate.

Sincerely,

Bill Musselwhite

YOUNGQUIST BROTHERS, INC.
C.W. (Bill) Musselwhite
Sr. Vice President

ESTIMATED PLUGGING AND ABANDONMENT COST

TAMIAMI CLASS II INJECTION WELL

2021

INJECTION WELL DETAIL: 8" ID Steel Casing to 2,450' bls / 4.5-inch ID FRP tubing to 2,440' bls / Nom. 7" open hole to 2,950 ft bls

ITEM	QTY	UNIT	UNIT PRICE	TOTAL COST
Initial Mobilization / Demobilization	1	LS	$70,000.00	$70,000.00
Remove 4.5" FRP Tubing & Wellhead	1	LS	$70,000.00	$70,000.00
Geophysical Logging (Full MIT)	1	LS	$40,000.00	$40,000.00
Gravel Open Hole 2,950' bls to 2,450' bls [O/H]	180	CF	$22.00	$3,960.00
Cement ID of 8.625 Casing 2,450' to Surface	670	CF	$22.00	$14,740.00
Complete Below Ground / Add Monument	1	LS	$2,500.00	$2,500.00
SUB-TOTAL INJECTION WELL ABANDONMENT				$201,200.00
CONTINGENCY		15%		$30,180.00
TOTAL PLUG AND ABANDON ESTIMATE				**$231,380.00**

EXHIBIT 9

FDEP Form 2: Performance Bond for Single Well

Florida Department of Environmental Protection	Oil & Gas Form 2
	Form Title: **PLUGGING AND SITE RESTORATION PERFORMANCE BOND FOR SINGLE WELL**
	Date Revised: March, 1998
	Incorporated by reference in: Rule 62C-25.008

This bond (or other form of authorized security) must be approved by the Department before the related drilling application will be processed. File with the Oil and Gas Program, 2600 Blair Stone Road, MS 3588, Tallahassee, Florida 32399-2400 (phone 850/245-8336). Email: OGP@dep.state.fl.us

Know All Men by These Presents That We, **Burnett Oil Co., Inc.**
(Operator's Name and Address)
Burnett Plaza, Suite 1500, 801 Cherry Street, Unit No. 9, Fort Worth, Texas 76102-6881

Phone Number: **(817) 332-5108** Fax Number: ____________

as principal, and U.S. Specialty Insurance Company
(Surety's Name and Address)
13403 Northwest Freeway, Houston, Texas 77040

Phone Number: (713) 355-3100 Fax Number: (713) 355-3101

As surety, are held hereby and firmly bound unto the Governor of the State of Florida in the penal sum of $320,000 lawful money of the United States, for the faithful payment of which we hereby bind ourselves, our heirs, executors, administrators, and assigns.

The condition of this obligation is that the above principal properly plug and abandon and restore the site of the following well, Permit #: ____________

Well Name and Number **Tamiami SWD #1**

Well Location (County, Section, Township, Range) **Collier County, Section 36, Township 51 South, Range 34 East**

and otherwise comply with Chapter 377, Part 1, Florida Statutes, and with Chapter 62C, Florida Administrative Code, and with all Special Permit Conditions of the Department. When the above principal plugs said well and restores the site in compliance with the foregoing Laws, Rules and Regulations, and Special Permit Conditions of the Department, this obligation is void; otherwise, the same shall remain in full force and effect.

Effective date of this bond April 8, 2021

Principal

Company: **Burnett Oil Co., Inc.**

Agent: KEVIN VERMILLION

Title: VICE PRESIDENT

Signature: [signature]

Date: 4/12/2021

Surety

Company: U.S. Specialty Insurance Company

Agent: IndemCo

Attorney in Fact: Meredith K. Anderson

Signature: Meredith K. Anderson

Date: April 8, 2021

Florida Resident Agent

Company: IndemCo

Agent: Edwin H. Frank, III, Florida Non-Resident Agent No. E177524

Address/Phone/Fax: 777 Post Oak Boulevard, Suite 330, Houston, Texas 77056
Phone (713) 355-3100 Fax (713) 355-3101

Serial Number of Bond: B013496

Signature:

Date: April 8, 2021

Approved as to Form and Legality:

DEP Attorney

Date

Approved by Department:

Department Approving Authority

Title Date

TOKIO MARINE HCC

POWER OF ATTORNEY

AMERICAN CONTRACTORS INDEMNITY COMPANY TEXAS BONDING COMPANY
UNITED STATES SURETY COMPANY U.S. SPECIALTY INSURANCE COMPANY

KNOW ALL MEN BY THESE PRESENTS: That American Contractors Indemnity Company, a California corporation, Texas Bonding Company, an assumed name of American Contractors Indemnity Company, United States Surety Company, a Maryland corporation and U.S. Specialty Insurance Company, a Texas corporation (collectively, the "Companies"), do by these presents make, constitute and appoint:

Edwin H. Frank, III, Michele K. Tyson, W. Russell Brown, Jr., Meredith K. Anderson, Stephen Michael Smith or Timothy J. Briggs of Houston, Texas

its true and lawful Attorney(s)-in-fact, each in their separate capacity if more than one is named above, with full power and authority hereby conferred in its name, place and stead, to execute, acknowledge and deliver **any and all bonds, recognizances, undertakings or other instruments or contracts of suretyship to include riders, amendments, and consents of surety, providing the bond penalty does not exceed** ******Three Million****** Dollars (***3,000,000.00***). This Power of Attorney shall expire without further action on April 23rd, 2022. This Power of Attorney is granted under and by authority of the following resolutions adopted by the Boards of Directors of the Companies:

Be it Resolved, that the President, any Vice-President, any Assistant Vice-President, any Secretary or any Assistant Secretary shall be and is hereby vested with full power and authority to appoint any one or more suitable persons as Attorney(s)-in-Fact to represent and act for and on behalf of the Company subject to the following provisions:

Attorney-in-Fact may be given full power and authority for and in the name of and on behalf of the Company, to execute, acknowledge and deliver, any and all bonds, recognizances, contracts, agreements or indemnity and other conditional or obligatory undertakings, including any and all consents for the release of retained percentages and/or final estimates on engineering and construction contracts, and any and all notices and documents canceling or terminating the Company's liability thereunder, and any such instruments so executed by any such Attorney-in-Fact shall be binding upon the Company as if signed by the President and sealed and effected by the Corporate Secretary.

Be it Resolved, that the signature of any authorized officer and seal of the Company heretofore or hereafter affixed to any power of attorney or any certificate relating thereto by facsimile, and any power of attorney or certificate bearing facsimile signature or facsimile seal shall be valid and binding upon the Company with respect to any bond or undertaking to which it is attached.

IN WITNESS WHEREOF, The Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 1st day of June, 2018.

AMERICAN CONTRACTORS INDEMNITY COMPANY TEXAS BONDING COMPANY
UNITED STATES SURETY COMPANY U.S. SPECIALTY INSURANCE COMPANY

State of California
County of Los Angeles

By: [signature]
Daniel P. Aguilar, Vice President

A Notary Public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

On this 1st day of June, 2018, before me, Sonia O. Carrejo, a notary public, personally appeared Daniel P. Aguilar, Vice President of American Contractors Indemnity Company, Texas Bonding Company, United States Surety Company and U.S. Specialty Insurance Company who proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature [signature] (seal)

SONIA O. CARREJO
Notary Public - California
Los Angeles County
Commission # 2239479
My Comm. Expires Apr 23, 2022

I, Kio Lo, Assistant Secretary of American Contractors Indemnity Company, Texas Bonding Company, United States Surety Company and U.S. Specialty Insurance Company, do hereby certify that the above and foregoing is a true and correct copy of a Power of Attorney, executed by said Companies, which is still in full force and effect, furthermore, the resolutions of the Boards of Directors, set out in the Power of Attorney are in full force and effect.

In Witness Whereof, I have hereunto set my hand and affixed the seals of said Companies at Los Angeles, California this 9th day of April, 2021.

Corporate Seals
Bond No. B013496
Agency No. 8353

[signature]
Kio Lo, Assistant Secretary

HCCSMANPOA05/2019

visit tmhcc.com/surety for more information

TEXAS COMPLAINT NOTICE

IMPORTANT NOTICE

1 To obtain information or make a complaint:

2 You may contact your agent.

3 You may call the company's toll free telephone number for information or to make a complaint at:

1-800-486-6695

4 You may also write to the company:

601 S. Figueroa St., Suite 1600
Los Angeles, CA 90017

5 You may contact the Texas Department of Insurance to obtain information on companies, coverages, rights or complaints at:

(800) 252-3439

6 You may write the Texas Department of Insurance:
P.O. Box 149091
Austin, TX 78714-9091
Fax No.: (512) 490-1007
Web: http://www.tdi.texas.gov
E-mail: ConsumerProtection@tdi.texas.gov

7

PREMIUM OR CLAIM DISPUTES:

Should you have a dispute concerning your premium or about a claim you should contact the agent or the company first. If the dispute is not resolved, you may contact the Texas Department of Insurance.

ATTACH THIS NOTICE TO YOUR POLICY:

8

This notice is for information only and does not become part or condition of the attached document.

AVISO IMPORTANTE

Para obtener informacion o para someter una queja:

Puede comunicarse con su agente.

Usted puede llamar de numerero de telefono gratis de la compania para informacion o para someter una queja al:

1-800-486-6695

Usted tambien puede escribir a la compañía:

601 S. Figueroa St., Suite 1600
Los Angeles, CA 90017

Puede comunicarse con el Departamento de Seguros de Texas para obtener informacion acerca de companias, coberturas, derechos o quejas al:

(800) 252-3439

Puede escribir al Departamento de Seguros de Texas:

P.O. Box 149091
Austin, TX 78714-9091
Fax No.: (512) 490-1007
Web: http://www.tdi.texas.gov
E-mail: ConsumerProtection@tdi.texas.gov

DISPUTAS SOBRE PRIMAS O RECLAMOS:

Si tiene una disputa concerniente a su prima o a un reclamo, debe comunicarse con el agente o la companie primero. Si no se resuelve la disputa, prede entonces comunicarse con el departamento (TDI).

UNA ESTE AVISO A SU POLIZA:

Esta aviso es solo para proposito de informacion y no se convierte en parte o condicion del documento adjunto.

IndemCo
Surety Bonds for the Energy Industry
777 Post Oak Blvd., Suite 330
Houston, Texas 77056
(P) 713.355.3100
(F) 713.355.3101

April 8, 2021

Florida Department of Environmental Protection
Oil and Gas Program
2600 Blair Stone Road, MS 3588
Tallahassee, Florida 32399-2400

RE: Burnett Oil Co., Inc.
Bond Number: B013496

To Whom It May Concern:

U.S. Specialty Insurance Company is authorized to issue Surety Bonds for the State of Florida under Non-Resident Agent License Number E177524 for Mr. Edwin Henry Frank, III, Attorney-in-Fact.

If you have any questions, please contact me at your convenience.

Regards,

Edwin Henry Frank, III
Executive Manager